KANSAS CITY

# REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. III. MARCH, 1880. NO. 11.

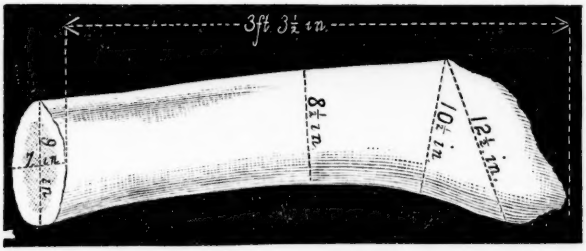
## PALÆONTOLOGY.

### MASTODON REMAINS FOUND IN JACKSON COUNTY, MISSOURI.

BY DR. F. A. BALLARD, INDEPENDENCE, MO.

The remains of a mastodon were known to exist in an old lick in the eastern part of the county, and this information having been conveyed to me by credible parties, backed by a fragment of a bone of the fore-leg, I thought it best to make a personal inspection of the remains. So in company with Mr. Tidswell and a guide, who knew the spot well, I went to the place indicated—some twenty miles east of here—and, upon inspection, found the road had been considerably washed, and numerous ruts, from a few inches to three or four feet, were found in very stiff, hard clay which apparently out-cropped just at that place, and no doubt formed the bottom of the lick, for such it had been, as a responsible person vouched for, in my presence. This clay overlaid a very thick bed of ferruginous sandstone and both the rock and clay were strongly impregnated with iron, as the color indicated. On the edge of the largest rut and on top of the ground I found the remains of what was supposed to be a log of peculiar kind of wood. What kind it was no one could tell, but a close examination showed it to be an enormous tusk in an advanced stage of decomposition, both by the action of the elements and the triturating and grinding process of wagon wheels, crushing the precious treasure every time they passed over it. One man declared that he had known "that 'ere log o' wood to be there nigh onto forty year, and hearn that a brute animal had died there." Others said that when it was first discovered, it was larger than any sapling found in that country anywhere. But the wood proved to be the monster tusk of a mastodon, and measured at the base (from the

imprint in the clay.) fourteen inches in diameter, or over forty-two inches in circumference, and as it lay *in situ*, twelve feet in length with a curve of probably two and one-half feet. At the distal end the tusk appeared to have been broken off and was all of four or five inches thick, and I judge there was at least a foot gone. Three feet of it were found in a state of preservation sufficient to bring home, a segment of which I gave to Judge West, who will exhibit it at the Academy




PORTION OF ULNA OF MASTODON, 53 POUNDS IN WEIGHT.

of Science. We found but one large bone, the ulna, a drawing of which is sent, with measurements. Other bones were found, presumably of the feet, but were in a soft condition and could not be handled. I think the drawing will illustrate the bone better than description, as the measurements are correct, and sketched from the picture taken of it. It is my intention to make more trips to the remains, and if possible, not wait for Gabriel's trump to arouse him from his slumbers, as the neighbors would do. I have the best wishes of the Hulse brothers, in the neighborhood, and others who are willing to render me all the assistance in their power. From the formation of the soil, I think I shall, during the coming summer have a rare treat for the scientists of Kansas City. I will keep the REVIEW posted in the discoveries as they progress from time to time.

---

# ARCHÆOLOGY.

## THE CONNECTION BETWEEN ARCHÆOLOGY AND HISTORY.

A. J. CONANT, ST. LOUIS, MISSOURI.

I am asked "whether it is the common understanding of anthropologists and archæologists that the pre-historic men of the Stone, Bronze and Iron epochs are, as Quatrefages states in regard to the Canstadt race, traceable continuously and connectedly 'through the entire space of time which has elapsed from the Quaternary period to the present day,' or that there is a gap between those of the Iron age and the pre-historic Egyptians, Chaldeans, etc."

As far as I am able to judge, I believe the statement of Quatrefages explains

the opinion of the best informed anthropologists, among whom the French savants stand, I think deservedly, in the front rank. But this opinion, I think, is only considered demonstrated beyond doubt as far as Europe is concerned. The antiquities of Asia and of the valley of the Nile have not been studied sufficiently to warrant conclusions and statements so positive concerning pre-historic man in those regions. The conditions in the latter country seem to have been so different as to cause the development of a civilization unlike anything found in Europe. We meet, in the valley of the Nile and on the Assyrian plains, long before the dawn of history, the remains of a civilization which astonishes us. This must be accounted for partly by the wonderful fertility of the soil. Take Egypt, for example. Here was a strip of territory shaped—as far as proportions of length and breadth go—like one of her obelisks, nine hundred miles long by ten miles in width, with a soil like that of our American bottoms, of exhaustless richness, and watered by the perennial flow of the Nile. When the first migrations took place from the central home in Asia, the tribe, or tribes, which first possesed this beautiful valley found nature producing spontaneously, almost, the needed fruits of the soil, and inviting them to tempt her bounty still further. The taste and habit for agriculture were speedily developed to a degree which required ages to accomplish in more sterile lands, and where men could derive their supplies more largely from the chase.

When Italy was known only as the home of a barbarous, savage people, and what was afterward known as Greece was inhabited by scattered families and insignificant tribes, known as Dorians, Æolians, and the like, Egypt stood forth alone in the splendors of her achievements in learning, science and the mechanic arts. Even then education was the heritage of the masses. In the granite quarries are pictures of men with tablets keeping account of the labors of the workmen. The French, in their explorations, discovered a tomb dating 1700 years before Christ, and inscribed to "To the Chief of Books," showing that at that remote period Egypt had her libraries and paid high homage to literature and her learned men.

When Germanicus Cæsar visited Egypt and gazed with wonder on her imposing monuments, he asked the priests to read the inscriptions with which they were covered. They replied: "These record the greatness of our nation in former times, when seven hundred thousand men bore arms and carried our conquests to distant lands," etc. And among the lists of the ancient rulers of those times, they read the name of a queen—Scemiophra. Facts like this speak volumes for the glory of Egyptian civilization, and tell unmistakably how woman was respected and adored in those early days of the world's history. Here were mighty cities, and thousands of canals connecting with the Nile, by which artificial lakes and reservoirs beneath the cities were supplied with water for irrigating the land and supplies in times of drouth. When we read of the long voyages of her mariners, and their cedar ships 500 feet long, we are filled with astonishment.

We cannot trace the growth of the civilization of Egypt; we only know her in her culmination and decline. She bursts forth like a meteor in the first pages of history, or like a bride appareled for her nuptials. While numerous barbaric tribes paid tribute to her power, they seem to have been influenced but little by their contact with the higher life and refining customs of the Egyptians.

So on the plains of Sodom we meet another phase of human development not unlike, in some respects, that presented in the valley of the Nile. Here, too, were numerous cities inhabited by a fixed people engaged in trade and manufactures, of which Sodom seems to have been the most important. When Abraham, the Hebrew (or immigrant, as the word means), fixed his home upon the uplands adjacent to the plain upon which the city stood, he could gaze from the door of his tent upon a scene of rare beauty, where, doubtless, as Croly says,

"On pomp and spectacle beamed morning's glow,
On pomp and festival the twilight fell."

It will be remembered that it is in connection with this city that we have the first account of organized warfare. Now the point to be specially noted is this: Among the tribes attacked by the confederated kings who came up against Sodom, was one tribe known as Horites, who also often afterward appear in history. Now these Horites were veritable Troglodytes—cave-dwellers. Here, then, we have the significant fact of a rude and primitive people living near, if not in close proximity, to the sumptuous civilization of the cities of the plain, and still preserving their ancient customs and modes of life. The same thing is taking place before our eyes, in our own country, to-day. The red men are displaced, but are not changed; they resist all our efforts for their civilization.

It will be seen, by the foregoing considerations, with what caution the archæologist should pursue his investigations, and how easily he may be misled in the conclusions he draws from the discovery of rude memorials which evidence almost infantile skill, when found in companionship with relics which indicate a high advancement of the industrial arts and social life; for it has sometimes happened that, under the fascination of a new discovery, able and conscientious men have been led by a temptation hard to resist, to lend the weight of their names to too hasty generalizations.

REV. S. D. PEET, CLINTON, WISCONSIN.

To the same question, Rev. S. D. Peet replies as follows:

CLINTON, WIS., January 10, 1880.

The archæologists have not come to any definite conclusion on the point as to the Stone, Bronze or Iron ages being successive, or synchronous. Many think that they overlapped, and in large districts there is no doubt that the ages did overlap, though it is probable that in localities the stages of society, or the succession of immigrating races, are marked by these distinctions. There is no gap between the Iron age and the pre-historic Egyptians. In fact, it is difficult in ancient his-

toric countries to tell when the Iron began and when the Bronze prevailed, and so, too, when the Bronze began and the Stone prevailed.

As to the *pre-historic* Egyptians, or Chaldeans, no one, to my knowledge, claims that there was a pre-historic age with these nations which can be traced separately from the historic, though in India this is the case, and probably may be in Persia. Troy, you know, had its various ages, as did Judea; but the Stone and Bronze are wonderfully mixed up.

I think Quatrefages is right as to Europe. The singular fact about America is that the highest state and order of man, so far as discovered, is the earliest. The auriferous gravels only confirm my position on that point, and the "missing link" is all bosh. *Tertiary man* may be the missing link, but produce him before you tell what he is.

PROF. O. T. MASON, COLUMBIAN COLLEGE.

And Prof. O. T. Mason answers it thus:

COLUMBIAN COLLEGE, D. C., January 14, 1880.

The opinions of archæologists are so divided as to the continuity of man in any portion of Europe, that it is best to hold our own in abeyance for more light. The craniologists rely upon certain characteristics to determine the question of race, and wherever these marks are found the race is forthcoming. If this be true—if the crania were all found in the exact geological environment from which they profess to have come, if the stratigraphical relations of quaternary beds are accurately known, and if certain cranial marks are the sure indications of certain races—then we may say something about the sequence of pre-historic tribes on a given area.

---

## RECENT ARCHÆOLOGICAL DISCOVERIES IN ADAMS COUNTY, OHIO.*

The Ohio Valley, and this immediate section in particular, is rich in remains of that wonderful prehistoric race, the evidences of whose civilization have been perpetuated in those curious pieces of engineering from which we derive the euphonious name "Mound Builders," given them by archæologists. Within the past few days wonderful discoveries have been made in this vicinity, which open up a new chapter in the history of this remarkable race, and throw much light upon their manner of living, their social nature, and their physical character. In different sections of the world, at different periods of its history, there have been found the remains of an enormous fauna and flora, and of a gigantic race of men. So rare and far apart have been these discoveries, however, that we have looked upon historical accounts of them as cleverly constructed pieces of fiction, and been loth to believe that there ever existed a race of men able to battle with the savage mastodon or the fierce megatherium. It remains for Adams County to come for-

* The statements in this article are very remarkable, but they are vouched for by a friend in whom we have great confidence.—ED.

ward with a startling confirmation of the scriptural text, "And there were giants in those days." For in Adams County have been found not only the bones of a gigantic race of men, but their implements of warfare and husbandry, and excellently preserved specimens of their art in sculpture, painting, engraving and writing.

Whether these prehistoric giants had a hand in the erection of those splendidly designed and durably constructed pieces of engineering which stretch across the country, from the headwaters of the Ohio to the mouth of Rio Grande, there to commingle with a similar chain of roads, mounds and fortifications coming down the Pacific Slope, and continue on through Mexico, Central America and the South American States, to be finally lost in the unexplored barrens of Patagonia, will be left for the solution of a wiser head than your correspondent possesses. He simply relates the facts; the scientists may build thereon the theories.

In conversation with some of the oldest citizens of this county I have been unable to learn the date of the discovery of a cave on the old Smith farm in Tiffin Township. Its existence was known to the earliest settlers, and they probably learned it from the Indians. For years it has been a place of resort for the curious, and was always esteemed a great natural curiosity. The old Smith farm is on the Portsmouth pike, between fifteen and sixteen miles northeast of Manchester. The farm is now owned by Mr. Samuel Grooms, and is a fertile, well-cultivated body of land. About a mile from the pike is a level plateau of two hundred odd acres, surrounded on all sides by lofty hills. As you near the mouth of the cave there is a gradual depression of the ground on all sides, forming what, in the local nomenclature, is denominated a "sink-hole." At the bottom of this circular basin is a hole, three feet in diameter, and about twenty-five feet in depth, at which distance from the surface you strike the floor of the first chamber in the cave, a dry cavern thirty by twenty feet, with smooth floor, roof, and walls of freestone. Crossing the room you enter a corridor five feet wide, connecting it with another chamber, smaller than the first, and this in turn is connected with a third chamber by a similar corridor. The third room is about the size of the first, but it has a lofty, arched dome, and the walls, floor and roof are of limestone. Through this rock water has oozed for countless ages, and formed thousands of glistening stalactites and stalagmites. Nowhere else in the cave do you find the limestone cropping out, and nowhere else do you find these slow-growing formations To gain access to the fourth chamber it is necessary to climb a steep bank and squeeze through a narrow fissure in the rock. In one corner of this chamber is an elevation, which, when surmounted, discloses a yawning well, with a mouth ten feet in diameter, and of unknown depth. Apply your ear to the edge of the well and you can hear the hollow roaring of a stream of water hundreds of feet below. Beyond this chamber are five others connected by narrow galleries. The cave comes to an end against a perpendicular wall of solid rock, in the ninth chamber, and about five hundred yards from the mouth. The floors of all the chambers except the one where limestone crops out, are dry. All are mathematically regular

in shape except this one. They are of different lengths, but all are of the same width and height. It is a romantic place for a picnic, and has been given up to such rural festivities for years. Every corner of the cave has been thoroughly explored a thousand times, and the walls of the limestone chamber are covered with the names of visitors and the dates of their visits. One, high up on the wall, reads, "Von Brady, 1789." Von Brady was a pioneer Indian fighter and hunter, who came here in advance of the "Ohio Company," in 1786. He was a daring man, and sent many of the red men to the "happy hunting grounds."

A few days ago a party of gentlemen visited the cave, provided with a plentiful supply of lanters, ropes and tools, for the purpose of exploring the mysterious well. The following were the gentlemen composing the party: Messrs. M. R. Brittingham and Andrew Long, leading Manchester merchants; Mr. Ernst T. Kirker, one of the editors of the Manchester *Independent;* S. Newton Griffith, Esq., of the Adams County bar; Mr. Samuel Grooms, the owner of the cave, and the *Commercial* correspondent.

Arrived at the cave, it was thoroughly explored, and then a rope ladder, 100 feet long, with which we had provided ourselves before starting out, was lowered down the well, and Mr. Kirker headed the exploration. When about fifty feet from the top of the well he called out to the party above to come down. We hastily descended, to find our friend standing at the entrance of a narrow gallery, leading out from the well. This gallery led back a considerable distance and got wider, debouching finally into spacious chamber.

The distance from the mouth of the well to the top of this gallery is forty-seven feet. From the roof of the gallery to the floor is ten feet, six inches. At its mouth it measures five feet, four inches in width. The gallery is straight, fifty feet long, has a gradual descent, and where it enters the main chamber, twenty-five feet in width. The chamber is 225 feet long, 110 feet wide, and twenty-four feet high. The roof, floor and walls of both the gallery and chamber are smoothly finished. In the center of this chamber is a sarcophagus and mausoleum combined. The mausoleum measures at its base fifty-five by thirty-five feet. It is of simple though wonderful design, and carved out of solid rock. Its base is paneled on all sides, those panels containing bas-reliefs which are supposed to illustrate the four seasons of man's life—childhood, youth, manhood and old age. At the ends of the bas-reliefs are tablets full of written characters, resembling the Hebraic, presumed to be memorials of the person or persons in whose honor the mausoleum is erected. The carving on the bas-reliefs is of the most delicate description, and fully equal to the Grecian school of sculpture. The limits of a newspaper article will not suffice to fitly describe them. From the floor to the top of this base is six feet. The base is hollowed out at the four corners, and these excavations are covered with slabs of freestone, accurately fitted and so firmly cemented that a cold-chisel struck with a heavy hammer made little or no impression on the cement. They are of uniform size, measuring five by twelve feet. In the center of the mausoleum rises a couch, two feet, five inches in height, twelve feet in length,

XUM

and five feet in width. On the couch is extended the figure of a man. It is probably of life size, and measures nine feet, four inches in length. The limbs are finely proportioned and disposed in an easy and graceful manner. The arms are folded across the breast, and the fingers clasp a bunch of leaves resembling the oak, reproduced with such fidelity to nature that they look like petrifications. Every vein and serration of the leaf is perfect. The figure is partially nude, a mantle or scarf crossing the breast and falling over the loins in graceful folds. The face is strong and robust in outline, and the contour of the features is decidedly Israelitish. The head is covered with a winged cap or helmet. At each corner of the couch is a vase four feet, five inches high, covered with beautifully carved flowers and leaves. They are in shape something like an amphora, except that the bottom is flat and the handles affixed to the body of the vase. The neck is thirteen inches in length and tapers gradually and gracefully. The vases are of uniform size, although the carved designs are different. They measure in circumference four feet, five inches. Suspended from the roof by delicate copper rods, directly over the head of the recumbent figure, is a copper lamp of unique design, elegantly chased. At each corner of the mausoleum rises a carved pyramid column, surmounted by caps that are unmistakably Doric.

On two sides of the room are tombs of humbler design. They are side by side, of uniform size, and twenty in number; ten on a side. Like the mausoleum, they are carved out of the solid rock, and embellished with bas-reliefs. Their dimensions are as follows: Length, twelve feet; width, five feet; height, five feet. The tops are covered with slabs, securely cemented. On the front of each is a raised scroll, covered with written characters similar to those on the panels of the mausoleum.

On the wall of the room opposite the entrance, are painted twenty-five faces, no doubt portraits of those whose bones lie in the tombs. They are faded and blurred, but still distinct enough to be deciphered. The colors used are red, yellow, black and white, and were evidently laid on with oil. The portraits are executed in a superior manner, and the anatomical portion of the features is preserved to an exact degree.

After our first astonishment over these wonderful discoveries had in a measure subsided, we seized the tools, and set to work to open one of the tombs. It was no easy task. Our chisels would not cut the cement which held the slab in place, and we were at last forced to batter the tomb to pieces. The walls were thin, and a few blows of a heavy sledge-hammer shattered the freestone to atoms. To our great surprise there lay before us not a few handfuls of crumbling dust, but a splendidly preserved mummy, swathed in cloth covered with a thick varnish, which emitted a pleasant aromatic odor not unlike balsam of fir. The mummy measured nine feet one inch in length, and the cloth in which it was wrapped, although of coarse texture, was skillfully woven. One of the party cut the wrappings from the face, but did it so clumsily that the head crumbled into dust. Portions of the hair remained sticking to the cloth, and your correspondent brought some of it away with him. It is black, curly, and of fine texture.

Besides the body of the giant, the tomb contained a spear-head, a hatchet, two lances, three mattocks or hoes, a spade, a cup, two plates and a small urn, all of copper. I appropriated one of the lances and the cup as souvenirs. These wonderful people understood the secret of hardening copper, for an ordinary file will barely scratch the lance, and the edge of a cold-chisel turns up like lead when struck against it. The cup is of softer metal, and beautifully engraved with trailing vines and wreaths. A square package at the head of the tomb, wrapped in the varnished cloth, was opened and found to contain a book of one hundred leaves of thin copper, fastened loosely at the top, and crowded with finely engraved characters, similar to those already described.

Lack of time and the total inefficiency of our tools prevented us from making further investigations, but when we ascended the well, we could plainly discern works of the sharp cutting tools used in excavating the cave. In the first two chambers, and in the last five, we had noticed many curious blocks of stone shaped like tables or benches, and presumed them to be of natural origin Later examination revealed the marks of chisel and pick, and these agents were undoubtedly used to fashion the entire cavern. The irregularity of the limestone chamber is due to natural causes. In all probability the room was dry when the wonderful people who designed and built it were alive. The stalactites and stalagmites have formed since. I measured one of the largest of the former. It was five feet, six and one-half inches from base to apex. Allowing that it lengthened at the rate of one inch every fifty years, which a geological friend tells me is a very rapid growth, it would have been 3,325 years reaching its present length. Conjecture alone can fix the date of the last occupancy of the cave. It must have been years before the stalactites began to form. I examined the mouth of the cave and discovered traces of a stairway which once led to the surface of the ground. Indeed, I found broken fragments of rock which, five or six thousand years ago, were undoubtedly parts of a broad staircase. There were also traces of a stairway which once wound around the sides of the well, affording easy entrance to the lower cavern. The upper cave must have been the cellar of a residence built above ground, and used for domestic purposes or a place of retreat in time of danger.

Mr. Grooms intends to open up all the tombs and the great mausoleum, arrange convenient means of entrance to the cave, and throw it open to the general public, charging a small price of admission to reimburse him. Several parties have visited it since the discovery of the lower cavern, and all are impressed with the wonderful character of the discoveries. Mr. Grooms is anxious to have a scientist examine the cave, and at his request a description of the discoveries, together with the engraved book, have been forwarded to the Smithsonian Institute.—*Cincinnati Commercial.*

XUM

## MASONIC DISCOVERIES.

Dr. Fanton, a highly instructed Mason, has finished a very careful examination of the foundations of the obelisk known as Cleopatra's Needle, at Alexandria, Egypt, and confirms Lieutenant-Commander Gorringe's discovery of the Masonic emblems, which establish the relations of many ancient Egyptian monuments. Dr. Fanton declares that the Hiram version of Masonry originating with the construction of Solomon's Temple, is disproved by the revelations of the foundations of the obelisk.

The Masonic emblem of Life and the Sun beyond doubt is identical with the Egyptian god Osiris. This proves that Masonry originated with the construction of the Pyramids, or at least with a far remoter period than the construction of the foundation of the obelisk. The number of blocks comprising the foundation, as well as their position and arrangement, indicate that the ancients were familiar with the higher degrees of Masonry—at least as high as the eighteenth degree. Many peculiar emblems, not understood by Lieutenant-Commander Gorringe, were fully explained by Dr. Fanton, from a Masonic point of view.

This discovery furnishes a clue to other important discoveries, not only under the fallen obelisks, but also in other parts of Egypt, rendering probable a solution of the mystery of the construction of the Pyramids. Among the discoveries was found a perfect cube, and also emblems of all Masonic foundations.

Lieutenant-Commander Gorringe, who is a member of the Masonic fraternity, entirely approves Dr. Fanton's explanation.

---

# GEOGRAPHY.

## ANCIENT GEOGRAPHY.

CAPT. E. L. BERTHOUD, GOLDEN, COLORADO.

(*Continued.*)

If we examine any modern map of the world, say one of Justus Perthes' last publications, in which the most recent discoveries are embodied, we will observe that, although in the South Pacific Ocean DeBougainville, Kerguelen, Marion, D'Urville, Cook, Wilkes and others have sailed in various and devious courses in the Antarctic seas, yet vast tracts of that ocean have never been visited by man, and that we have an ideal Antarctic Continent set before us that has been dimly seen—and never explored—at a few points, distant from each other, and of whose extent and proportions fogs, snows and a sea covered with floating ice rendered uncertainty more uncertain. It is yet a real *Terra Australis Incognita.*

Patavino is here, however, quite positive from his standpoint, and in no manner sparing of theoretical information on this unknown Southern Continent. Just where he obtained his information about this circumpolar continent south of the Spice Islands and Java, we cannot now so clearly tell; but it proves that already, in 1597, Autralia was definitely known. Yet ninety years afterward, when Dampier explored the west and north coasts of New Holland, and also New Guinea, Australia was known only to him as Eëndracht's, or Houtman's (Dutch navigators who were popularly supposed to have been the first to ever sight its shores) Land.

The Spanish explorer and navigator, Quiros, who had traversed, in about the years 1605 and 1606, the whole South Pacific from South America to New Guinea, proclaimed his discovery of lands in the South Pacific, christening them "Terra Australis." In after times his discoveries for a long period puzzled other navigators, who in vain ransacked the South Pacific Ocean for his continent, lost to all others, and which Capt. James Cook proved did not exist except as an ice-clad Antarctic land, formed, perhaps, only of islands that are connected by the enormous ice-fields of perpetual frost—fit habitation for the penguin and the ever-restless albatross.

From the Terra Australis, if we follow Patavino's map into the China seas, we will find here but few of our modern familiar names. But even when we find the Moluccas, Philippine Islands, Mindanao, Matelotes, and Japan, how unlike in shape and erroneous in position! Looking at the Chinese coast, we see a general resemblance to modern maps, but we find no Corea, no Saghalin Island, no Kamtschatka, even after we pass the last two points where we would expect to see them. Instead of this, we have a coast bearing off to the north from the parallel of 40° north latitude until we reach the 59th parallel of north latitude. Here we find delineated Cape Tabin, the most northeasterly point of Asia washed by the Arctic Sea, which is shown as stretching eastward more than 25° of longitude to the American coast, which seems to bear in direction east-northeast, very much as it is known to-day, between Behring's Strait and Icy Cape.

But here we find the queerest bit of information possible. Our modern geographer gives us, as his authority for the location of Cape Tabin, Pliny himself! For, in Book VI, Pliny says:

"Beyond the Caspian Sea and the Scythian Ocean, the land projects far to the east, * * * the face of its shores being turned toward the rising sun. Next to this the land is uninhabited, from the amount of snow. The next region is wholly uncultivated, from the ferocity of its inhabitants and the multitude of wild animals. Beyond these deserts are other Scythians; then other solitudes, as far as the ridge of mountains overhanging the sea which is called Tabin."

Pliny does not give his authority for these statements; but, evidently, he had them from some one who, in the zenith of Roman power in Asia, had penetrated into the Siberian deserts. But this was enough for Patavino. So he gives us a very creditable map of Siberia, with the peninsula of Cape Taimur, which he calls Scythicum Promontorium, extending to about 82° north latitude. In this land of

desolation, Siberia, he gives us a lake and a river, which in Taimur Land are known to-day as Taimur Lake and Chatanga River, where he also locates the places of habitation of several Siberian hordes. Eastward of Taimur we see a large river beyond what he calls Chiorsa, or the Karakorum Desert. This river begins in the Altai Mountains, and probably was meant for the River Lena, but its mouth is located in about latitude 56°, while southward, but up the river, appear the cities of Cambalu, Tenduch and Xinguer, so much celebrated by Marco Polo. But, as their location is given north of the Altai Mountains, and as these cities were Mongolian, or Chinese, this, with the erroneous latitudes given, makes it plain that our mediæval geographer was much mixed in his authorities. This is still more evident as the Karakorum pass and desert lie immediately north of the vast Himalaya Mountains, and is one of the avenues into central Tartary.

Among the various facts (?) that we find given by our author in his description of Tartary beyond the Jmaus (Himalaya) Mountains, which he calls Cathay, Tangut, Tendu, Tebet, Koondo, etc., as its several provinces or kingdoms are called which are under the empire of the Grand Cham of Tartary, whom he describes as a descendant of the great Ghengis Khan. Then he naively tells us that "it is quite evident that his (the Great Cham's) money is not made of any *metal*, but is made of mulberry bark, reduced to pulp and held together by some glutinous substance, upon which, indeed, is *printed* the royal seal; so that, by means of this manufactured money (*factitia moneta*), he has accumulated an enormous amount of gold, silver and precious stones." A regular Greenbacker was the Grand Cham, who has many to-day that are emulous of his questionable money fallacies.

We will now leave our old worthy professor and his many whimsical conceits, and give him the credit for showing us that even at that time the fact was known that Asia and America were separated by a strait, and its discovery can not be claimed by the Russians as an original discovery by Behring, but that, long before him, one Staduclein, a Russian traveler, had sailed from the Lena and Judighirka, around the Sch elagakoi Noss, or North Cape, and had reached Behring's Straits, just as, in 1879, Professor Nordenskjöld has demonstrated can be done by his wonderful trip from Cape North, in Norway, to Behring's Straits—all the way around Taimur Land, New Siberia, Baranow Island and North Cape to Behring's Straits and Japan. By him the mysteries of the "Scythicum Promontorium" and Cape Tabin are solved.

# EXPEDITIONS TO THE ARCTIC SEAS.

## CONGRESSIONAL REPORT.

[In the House of Representatives at Washington, on January 15, 1880, Mr. Whitthorne, from the Committee on Naval Affairs, submitted a report from which the following extracts are made:]

The Committee on Naval Affairs, to whom was referred House Bill No. 1823, "to authorize and equip an expedition the Arctic Seas," having had the same under consideration, have directed the same to be reported back to the House with a substitute therefor, and thereupon to recommend the adoption and passage of said substitute, herewith submitted:

In making this report the committee respectfully state and report that the object of the bill, as is shown by its terms, is to authorize a temporary station to be selected within the Arctic Circle, for the purpose of making scientific discoveries, explorations, and observations, obtaining all possible facts and knowledge in relation to the magnetic currents of the earth, the influence of ice-floes therefrom upon the winds and seasons and upon the currents of the ocean, as well as other matters incidental thereto, developing and discovering at the same time other and new whale-fisheries, now so material in many respects to this country. It is, again, the object of this bill that this expedition, having such scientific observations in view, shall be regularly made for a series of years, under such restrictions of military discipline as will insure regularity and accuracy, and give the fullest possible return for the necessary expenditure; and, again, in view of the fact that either the governments directly, or scientific corps under their authority, of Germany, Holland, Norway, Sweden, Austria, Denmark, and Russia, have concurrently agreed to establish similar stations, with like object, during the year 1880, it is believed that the interests and policy of our people concur in demanding that the United States should co-operate in the grand efforts to be thus made in the solution of the mysteries and secrets of the North Polar Seas, upon which, in the opinion of scientists, depends so much that affects the health and wealth of the human race.

This subject has for many years, and especially during this century, engrossed a very large share of the attention of the scientific world. The enthusiasm of those who have ventured so much, in a region where naught of individual profit could be an inducement, and the sole motive could only be "the good of mankind," is worthy of our highest regard and admiration.

Congress has, at different times and in different ways, given the sanction and encouragement of the Government of the United States to expeditions and explorations into this region, and always, as your committee believe, with the approbation of the people, and lately, with singular unanimity, to the expedition fitted out by a distinguished, wealthy and liberal citizen of the United States, Mr. Bennett, whose vessel, the Jeannette, now under command of Commander De

Long, of the United States Navy, sailing under the national flag, by authority of Congress, is penetrating this ice-bound region by way of Behring's Straits; and no well-informed citizen but hopes with pride that success shall mark the venture, and that, in its beneficent results to science and humanity, the generous liberality of the owner of the Jeannette shall find his deserved reward.

Your committee, aware of the deep interest felt in these explorations, and particularly that which has been manifested in the plan known to the American public as the "Howgate plan," as is manifest in the petitions and memorials from scientific and commercial bodies of all parts of the country, sent to this and preceding congresses, and desiring that its friends should briefly explain its history, purposes, and expected resesults, by addressing them the following queries, to elicit this information and so present it to the House, and which they here now present.

On behalf of the committee, it was requested that it should be shown—

I. Chronologically, a brief of the various national expeditions to the Polar Seas, and under what auspices made.

II. A brief of the alleged scientific results of these expeditions, and references.

III. What are the expected and hoped-for results from the proposed expedition, scientific and economic?

IV. The special reasons, etc., for the plan proposed by the bill H. R. No. 1823.

To which answer was made as follows:

### I.—CHRONOLOGICAL.

Two expeditions were sent out by the Russian government in 1820, commanded by Admiral von Wrangell and Lieutenant Anjou, to explore the regions north of Siberia.

The following expeditions were sent out by the British government in the years named:

Captains Ross and Parry, in 1818, to discover the northwest passage, and Captain Buchan and Lieutenant (afterward Sir John) Franklin, in the same year, with a thoroughly equipped expedition, to reach the Pole.

Captain Parry, in 1819, was sent to explore the regions north of Hudson's Bay.

Sir John Franklin was sent out on a land expedition in 1820 to explore the north coast of America.

Captain Parry was sent in 1821 to explore the regions north of and around Hudson's Bay.

Captain Parry was sent again in 1823.

Captain Lyon was sent out in 1824, via Hudson Straits.

Sir John Franklin made a second land expedition in 1824, *via* the Mackenzie River.

Captain Beechey was sent in 1825, *via* Cape Horn and Behring's Straits.

Captain Parry was sent in 1827 to reach the Pole, via Spitzbergen.

Lieutenant Back, in 1833, was sent in command of an overland expedition through the Hudson Bay territory.

Captain Back was sent in 1836 to complete the survey of portions of the coast-line north of Hudson's Bay.

Sir John Franklin was sent out in 1845 to search for the northwest passage.

In 1847 the British government sent out three expeditions to search for Sir John Franklin.

In 1850 three other search expeditions were sent out by the British government.

In 1852 Sir Edward Belcher was sent out in command of five vessels to search for Sir John Franklin.

In 1852 Captain Inglefield was sent out to search for Sir John Franklin.

In 1875 Captains Nares and Stephenson were sent out to reach the Pole, *via* Smith's Sound. This was one of the best equipped expeditions of modern times.

In 1869 the German government sent out an expedition in command of Captains Koldewey and Hegemann, toward the North Pole.

Austria sent out an expedition in 1872, in command of Lieutenants Weyprecht and Payer, to reach the Pole via Nova Zembla.

The United States sent out Captain Hall, in the Polaris, *via* Smith's Sound, in 1871.

These comprise the principal governmental Arctic expeditions during the present century. During the same period a large number of private expeditions have been fitted out in this and most of the northern countries of Europe. The expeditions of De Haven, Kane, Hayes, and Hall, from the United States, and those of Professor Nordenskjöld, from Sweden, received some slight aid from their governments, but their cost has been borne principally by private citizens.

For detailed accounts, see the published narratives of the several expeditions. For a brief account of the work done before 1857, see a small work by Epes Sargent, called "Arctic Adventures." See, also, for this, the preliminary chapters of the "Narrative of the Second Arctic Expedition made by C. F. Hall, 1864–69," prepared by Professor Nourse, United States Navy, under orders of the Secretary of the Navy.

II.—SOME GEOGRAPHICAL AND SCIENTIFIC RESULTS OF PAST ARCTIC VOYAGES.

1. The discovery and survey of the vast territory lying north of the American continent, between the sixtieth and eighty-third degrees of north latitude, and longitude 50° to 170° west of Greenwich.

2. The discovery of Francis Joseph Land and Wrangell's Land, north of Europe and Asia, and of the survey of the northern coast-lines of these continents.

3. The discovery of the magnetic pole, which has proved so valuable to commerce and navigation.

4. The discovery of new whaling grounds, notably by Captain Hall, in Cumberland Gulf and adjacent waters, by which millions of dollars were added to commerce of the United States.

5. New species of birds, of animals, and of fishes have been discovered, some of them of commercial as well as scientific value.

6. New minerals of value have been found, some of which do not exist elsewhere.

7. Interesting studies in ethnography and kindred sciences have been made.

8. Our knowledge of magnetism, electricity, meteorology, and of ocean currents has been greatly increased by observations within the Arctic regions.

See, also, the narrative of Professor Nourse, before alluded to.

EXPECTED AND HOPED-FOR RESULTS—SCIENTIFIC AND ECONOMIC.

The plan proposes to take only such persons already in the public service for whose pay and subsistence the government now provides; the vessel is no charge, and only such small sum as may be necessary to prepare it for this special service is sought from the government.

While your committee believe that the interests of geographical and scientific discoveries as set forth by Professors Henry, Loomis, and others, in connection with the proposed Arctic station, are of themselves of sufficient magnitude to warrant favorable legislation, they do not exclude the additional practical consideration of the political and commercial results that are probably to flow from the discovery of new fields for the whale-fisheries. That large section of country from which springs the American sailor, whose education and wealth is largely derived from these fields, is entitled, as a matter of justice, to have their interest cared for in this direction. This home of sailors becomes, not only an element of commercial wealth, but a resource of national defense, which should not be lost sight of by the American statesmen. It is for these considerations your committee have been induced to report favorably upon the plan proposed in H. R. No. 1823.

[Substitute for H. R. No. 1823.]

A BILL TO AUTHORIZE AND EQUIP AN EXPEDITION TO THE ARCTIC SEAS.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

That the President of the United States be, and he hereby is, authorized to establish a temporary station at some point north of the eighty-first degree of north latitude, on or near the shore of Lady Franklin Bay, for purposes of scientific observation and exploration, and to develop or discover new whaling-grounds; to detail such officers or other persons of the public service to take part in the same as may be necessary, and who are willing to enlist for such purpose, not exceeding fifty in number, and to use any public vessel or vessels that may be suitable for the purpose of transporting the members of said station and their necessary sup-

plies, and for such other duty in connection with said station as may be required from time to time: *Provided*, That the President of the United States is authorized to accept from H. W. Howgate, and fit out for the purposes of this expedition, the steamship Gulnare, which vessel shall be returned to its owner when the objects of the expedition shall have been accomplished, or when, in the opinion of the President, its services are no longer required: *Provided further*, That the United States shall not be liable to any claim for compensation in case of loss, damage, or deterioration of said vessel from any cause, or in any manner whatever, nor be liable to any demand for the use or risk of said vessel.

## DEATH OF AN AFRICAN EXPLORER.

Intelligence has been received at Paris that the Abbè Debaize, in attempting to cross Africa, has died at Ujiji. He was commissioned by the French government to traverse the continent from Zanzibar to the Atlantic, and to aid him the sum of $20,000 was appropriated. He left Marseilles on April 21, 1878, and organized his expedition, with nine missionaries and 400 camp followers, in less than two months. On July 25, he left the coast and after passing a Belgian missionary expedition, he made his entrance with flags flying and music playing into Kouihouron, the capital of Unyanyembe. Thousands of negroes gathered round and received the travelers with boisterous and uncouth welcome. The Sultan and Governor came out to the city entrance and conducted them to the building that Cameron had occupied before them. In his report to the Minister of Public Instruction the Abbé stated under the date of October 17, that hitherto his mission had been lucky and that not one of the hundred men in his caravan had deserted. The Abbé had been in good health all along and had managed to preserve his baggage intact.

## PASSAGE OF THE "MIDDLE PACK."

The southern edge of the "North Water" extends from Pond's Bay on the west side in a northwesterly direction to Cape York, and there are three routes through the middle pack by which it may be reached. The first and only safe one is called by the sailors the "North-about Passage," along the Greenland coast. The second is by entering the drifting pack in the center of the Bay. It is called the "Middle Passage," and should only be attempted late in the season, when the land ice of Melville Bay is generally broken up. The third, called the "Southern Passage," is along the west side of Baffin's Bay, and can only be effected late in the season, or after a long continuance of southerly winds.

The earliest passage into the "North Water" was made on June 12, 1849, and the average date of passage made by whalers for twenty-three years was July 13th. In the years 1825–28–32–33 and '34 the whole whaling fleet got through to the "North Water" before the middle of June. John Davis was stopped by

the ice of the "Middle Pack" on July 1, 1587. Baffin reached the "North Water" in 1616. Ross and Parry reached it August 8, 1818, having been thirty-eight days getting through the pack. In 1853, Dr. Kane, in the Advance, reached the "North Water" August 3d, after a passage of eight days. In 1860, Dr. Hayes in the United States, (a sailing vessel,) made the passage in fifty-five hours. In 1871, Capt. Hall in the Polaris, made the passage in less than twenty-four hours. In 1875, the Alert and Discovery, of the British Expedition, left Upernariv on the evening of July 22d, and sighted Cape York on the morning of July 25th. The passage through the pack was made in thirty-four hours.

The navigable season continues until the end of August, but the edge of the pack should be reached by the middle of June if practicable.

---

# TECHNOLOGY.

## THE RELATION OF ÆSTHETICS TO INDUSTRY. *

V. W. CODDINGTON.

There is established in man an earnest desire for the excellent. It is one of the characteristics of the human being to choose the superior in preference to the inferior. The exercise of the faculty of choice is the chief occupation of mankind. The earliest intelligence displayed by the infant, is when it can distingush one object from another and make choice between them. And the highest functions of intellect exercised by the sage are of the same order, when he considers the delicate distinctions that separate one theory from another, and gives one peference over another.

The question of approval and disapproval comes before every human being at every step of his existence—man travels through the world smiling at this and frowning at that. The sky is brilliant with the hues of sunset. He is pleased. He looks abroad upon the green fields with their trees and flowers, and birds and brooks, and says, "It is good." But the rain and snow, the frost and wind; these are elements of experience that are not so agreeable. They seriously deange his pleasures; they disturb his enjoyment of these many beautiful things; they even interfere with the ready obtainment of the necessaries of life. Consequently the desire to better himself, and multiply around him comforts and excellencies.

This desire for excellence has been from the first, the germ of human growth; the mainspring of all progress, the paramount motive impelling men to action. It is the guiding spirit of intellectual advancement. It is the abiding inspiration of the artist. In the commoner matters of life it originates every invention; is the father of improvement. In short, whatever that is commendable, whatever of good

* Read before the Kansas City Academy of Science, January 27th, 1880.

or worth that has been accomplished by men, is due to their desire for the excellent. Now we propose to consider this question, at present, where its phenomena have taken shape in the industrial arts. Every industry finds its reasons to exist in this desire for something better.

The primitive man, to facilitate the labor of his hands discovered and manufactured the stone ax. His descendant, not yet satisfied with the efficiency of the tool, improved it by using copper instead of stone, and generations still farther along in the course of time, had recourse to iron, and of later in years the finer and more excellent form of steel.

Though long centuries measure off the distance between the rude beginning and the perfect consummation, and the advancement made was so slow as to be almost imperceptible, each step taken was the out-growth of that insatiate craving for the excellent.

Now the elements of excellence are as manifold as the objects which possess them. Some are obvious; they force themselves upon the understanding; they can not be contradicted. Others are not so palpable, it requires an effort of the reason to bring them to the surface, and they become well defined only after diligent inspection. Again, there are others which are as subtile and delicate as sweet perfume, one recognizes and appreciates and approves them, but can give no reason why. For the sake of convenience we will divide all of the elements of excellence into two classes. 1st, the obtrusive. 2d, the abstruse. I can best define the distinction between these two classes by illustration.

The savage enhances the value of his arrow as a destructive projectile, by pointing it with some hard substance, such as flint or iron. He increases its accuracy by fastening feathers to the end. To keep his arrows together and have them ready for immediate action he makes a quiver. These things possess the obtrusive elements of excellence. They have an obvious reason for existing. No one will question but that they have a purpose and are adapted to that purpose. But the rude man is not yet satisfied. There is in his nature that which calls for something more. He stains the feathers of his arrow. He stripes his quiver with various colors and begirts it round about with a fringe. In his own estimation he has added greatly to their value. What he has added constitute some of the abstruse elements of excellence.

Again, for I would have this distinction clearly understood: The Fiji Islander for the purpose of propelling his canoe, manufactures a paddle. With the greatest care he measures the length of the blade and its width, and the length of the handle. He pays great attention to shaping it in such manner as to obtain the maximum amount of efficiency with a minimum amount of exertion. The implement possesses all of the obtrusive elements of excellence. As a paddle it is complete; but the Fiji goes farther, with much care and skill he cuts the entire surface of the paddle into various delicate patterns. It now possesses abstruse elements of excellence, and they add to its value three, four, or even ten-fold; while as an object of utility he has not at all increased its worth. But he has an

article, which, in the markets of Fiji-land will command a much higher price than if left as he first made it. The first act of this savage in the making of his paddle was the work of a mechanic, the second part of the work was that of an artist, each we will say, was perfect in its conception and in its execution, and the result is an implement perfectly adapted to its purpose and a never ending source of pleasure to the beholder. Thus the Fiji Islander attempts to manufacture all of his utensils, be they instruments of war, of the chase, or for domestic purposes. All of the savage tribes, to a greater or less degree are actuated by the same motives, and they are typical of those early workers of the Orient, who gave the first impulse to industrial art

EVERY complete product of industrial art is the joint effort of the mechanic and the artist. The mechanic having as an object, the obtrusive, and the artist working in the interest of the abstruse elements of excellence. To determine the relative importance of the labor performed by these two individuals is a problem not easy to solve. It is much akin to the solution of the question, which is the most important part of the plant, the flower or the stalk? The value of that which has utility no one will gainsay. We measure our advancement in civilization by the improvements which we make in the process of gaining the necessities and comforts of life. The plow, the steam-engine, the reaper, the spinning-jenny, the sewing machine; these are mile-stones in the progress of civilization. We point at them with pride and say, "These are the proofs of our civilization." These are the things which help satisfy the demands for food and clothing. But if we go abroad in the world, we find that in addition to the hunger for food and clothing, there is a hunger of the intellect, and a hunger of sentiment, both of which make their demands, and their demands are urgent. Take man in the aggregate and the æsthetic part of his nature calls for gratification almost as loudly as his stomach calls for food. I have seen the American Indian exchange pelts representing months of labor in hunting and trapping for a few yards of broadcloth, some calico and some beads wherewith to decorate his person, and his example is followed to greater or less degree by his fellow-beings the world over. The civilized man demands æsthetic qualities in almost everything with which he has to deal. He spends—notably the feminine part of him—many millions yearly, to gratify the love of beauty, and with every article produced in the higher manufacture, the question always arises, "How does it look?" This question forced itself upon the untutored citizen of pre-historic times while fashioning his rude vessels of clay, as the remnants of them unearthed to-day bear witness.

Granted now that both of these attributes, the useful and the æsthetic, the obtrusive and the abstruse elements, are essential to the perfect product of industry, how are we to obtain them in the highest degree of perfection? It is an uncomfortable fact that the product of "civilized" industry is oftentimes wofully ugly, grating harshly against our finer senses or perchance, if forced upon us from childhood, drowning out what little artistic feeling we may naturally possess. On the other hand, I have seen objects for the purpose of beautifying which, so much labor had been spent that they seemed to have risen above their station and al-

most utterly refused to do the work allotted them, and when approached with intentions of honest use, seemed to warn one off with the ejaculation, "Don't, don't touch me: I'll, I'll break."

These are extremes into which we are at all times in danger of running, examples of both besetting us upon every hand. But such a result is not due to a want of harmony between the useful and the æsthetic, between the obtrusive and the abstruse elements of excellence, because they do exist in the same object in the highest degree of development. The great intellect that fashioned all things did not decree that beauty and use should go apart; that the stern, practical processes of our nature should of necessity be unadorned. Nature points to the converse. Those material things which are endowed with the highest functions of usefulness are made the most beautiful; and we, if we reach not such a consummation in the works of our minds and our hands, must blame our own short-sightedness rather than the incompatibility of the thing. The history of art industry shows us many beautiful things which served an humble purpose. For example, the water-pots of the ancient Greeks and Egyptians. Some of them were made for the purpose of storing water in large quantities; they had large receptacles, large bottoms, were open-mouthed, and easy of access. Others were made to accommodate the general purposes of the household, substantial bases but not cumbersome, and the body of the vessel was so arranged with reference to the handle that a slight turn of the wrist was sufficient to pour out the liquid. Other vases served the purpose of carrying water long distances. You all know the old custom, how the maidens gathered at the fountain and at the river to get water for the household. The vessels which they used were made larger near the base, and of such shape as to be easily carried upon the head, the neck of the vessel being very small to prevent the water from splashing easily over the top. Handles were provided of such shape that two persons could easily carry a vase between them, and if placed in the water it would dip under the surface without any exertion upon the part of the owner. These different vases were all admirably adapted to the work which they were to perform, and yet they were so exquisitely shaped that to-day we buy feeble copies of them and place them upon our mantles as ornamental features.

The people who made these vases were artists, artists in the truest sense of the word; studying utility with the closest fidelity, and at the same time touching their work with an inspiration that made a thing of beauty out of the humblest implement. Does any one think that we have progressed in this respect? Does he remember how he tried to get water out of a cistern, with an ordinary wooden or tin pail, how it persistently kept its gaping face above the water, and how he wished for a hundred-pound weight to drop into it? and how, when after much perseverance he had the pail filled, he lost a large percentage of the liquid trying to get it into the house? And who has not seen the good wife grow red in the face, as if in imminent danger of bursting a blood-vessel; while attempting to induce a coffee or tea-pot to part with a portion of its contents? And who among us is ready to put in a plea for the *beauty* of the modern pail and coffee pot?

Now some one will say that it is taking unfair advantage to draw example from so lowly a place as the kitchen. I answer, that the humblest flower has its fragrance, and that the humblest utensil may bear the fragrance of art. There is a false conception, which has prevailed for many hundred years—I am glad to know that it is beginning to decay—that there could be no coalition between high art and practical industry. The truth is, they were wedded long centuries ago, and all discord that has risen between them since has been entirely due to the ignorance and egotism of their respective disciples. Said disciples have admirably succeeded in misunderstanding each other. The artist says to the mechanic, "You are ignorant and boorish; you have no taste. If I couldn't make a better looking thing than that, I would make nothing." The mechanic says to the artist, "I'm a practical man. I don't know anything about your fine-spun theories; but when I make anything it works, and I guess it looks just about as well as any o' your fancy fixins."

The result is discord where there should have been union. The artist, if he deigns to serve the manufactures with his genius, produces ornamentation incompatible with the nature of his work. The mechanic manufactures articles ostensibly to serve a useful purpose. It may be bureaus or bedsteads; but he finds among his customers a very decided demand for something more than mere utility, and he, of course, attempts to satisfy that demand. The result is often—from the artist's standpoint—a conglomeration of monstrosities frightful to behold; but there is the evidence of the attempt, ofttimes a very expensive one, and the public is satisfied and calls it splendid.

From the above, we may set this down as a rule, that if any product of art industry is imperfect, the artist who made it was not a mechanic, or the mechanic who made it was not an artist. In our own country to-day, it would, usually, read: "The mechanic who made it was not an artist." This being true, probably the quickest way to reach the best results in industrial art would be to make an artist out of the mechanic. In Massachusetts, steps have been taken in this direction. Art schools have been established with the express purpose of introducing art into industry, and they are doing a good work. The only fault that we can find is, that there are not enough of them. They ought to be established all over the country. The result in a few years would surprise the most sanguine. Not only would art receive an impulse, but manufactured products would be better in every respect; for, if the mechanic becomes an artist, he is the better mechan c for having become so.

But we cannot expect a great deal of progress in art industry until the people, the general public, are able to distinguish the good from the bad. As long as poor art is marketable, it will be manufactured; and when no distinction is made betwen the inferior and the superior, the inferior will predominate. The Centennial Exhibition did much for the education of our people in this respect. As an instance, see the advancement that has been made in the art of book-binding. What a contrast is presented between the work of to-day and that of a few years ago, both in the beauty and the quality of the work. Other departments of in-

dustry have also received great benefit from the Centennial Exhibition. But we, as a people, have much to learn; we are yet on the threshhold. Our homes as receptacles of art are poverty-stricken. The time when every article we use shall give forth the fragrance of good art feeling is yet to come.

It may not be amiss, in this connection, to consider what are some of the essential requisites of excellence in art industry. You will remember that I divided the elements of excellence into the obtrusive and the abstruse.

Of the obtrusive elements, stands, First, Utility. Nothing has a reason to exist unless it serves a purpose. Nature abhors uselessness as intensely as she abhors that vacuum which we hear so much about. She never, in all of her labors, creates anything that has not a definite work to perform, and when the task is accomplished disintegration commences, and the elements of which the thing is composed are hurried off to the performance of other duties.

Second—Durability. Other things being equal, that article of manufacture which is to all appearance most durable, is accounted most desirable The chair that would endure but one sitting, no matter how pretty it might be otherwise, would have but little art value. And, of two similar chairs, the one that would outlast the greater number of sittings would be the most valuable. The mediæval architects understood this principle. Using, as they did, as little material as possible, their structures always took that pyramidal form which the eye knows to be the form of durability. The old cathedrals standing to-day bear evidence of their wisdom. There is something in the mere capacity to endure that excites our admiration, and especially attractive is it when we find it in the works of men.

These attributes of excellence—utility and durability—are dominant; their claims are above all other claims. They admit of no interference with their rights. Any object of industrial art which does not possesss them is not what it should have been.

There is a false idea of art—notably prevalent during the Renaissance period, which dates from the fifteenth century until now—which places the claims of beauty before those of durability, and ofttimes of utility. Articles of furniture were cut and carved into all manner of grotesque shapes, under the impression that so they were more beautiful, though the nature of the material used cried loudly against it.

(*Continued.*)

---

It is not surprising that barley, potatoes and many other plants and vegetables ripen in the most northern latitudes, seeing that they are exposed to a considerahle amount of heat during two or three months of the year. In those regions where the sun hardly descends below the horizon in summer, there is no night, only a short twilight; the growing plant, therefore, enjoys permanently, and without interruption, the heat and light which it requires.

# ENGINEERING.

## SANITARY ENGINEERING IN KANSAS CITY. *

BY ROBERT GILHAM, C. E., KANSAS CITY.

* * * * * * * * * *

Kansas City requires very extensive sanitary improvements, and the question of method should have been determined long ago. Instituting works of this character, at the present stage of the city's history, will require larger sums to complete than if they had been organized earlier in the city's growth. It is apparent that time has been wasted.

It is necessary first, to become acquainted and familiar with the local and general requirements of the city. A topographical map of the city should be made, indicating the contour of the surface, including a great portion of the surrounding country, and especially that territory which will soon be incorporated in the city. All the main drains, outlets and laterals, districts and sub-districts should be clearly indicated, including also diameters, areas and inclinations, in a table of references, which should be determined after a careful and extended examination of the maximum and minimum amount of rainfall within the proposed drainage area, and all other means that will directly or indirectly contribute to the volume in the sewers.

The nature of the soil and inclinations of streets and surface generally should be carefully considered, as they become important factors in the computations. After all the facts have been obtained, the city government should adopt such plans as the engineering skill employed can furnish. There should be a general plan, and all local improvements should be made to conform to it. Modifications may become necessary in the execution of the works, to meet unforeseen circumstances which can be overcome without materially changing the general plan. No modifications should be made to accommodate ward politicians for the sake of political influence. Politics should have no part in the execution of these improvements. It is the experience of other cities that where politics play a part in improvements of this kind they inevitably prove a failure. It is true there is a great cost attached to sanitary improvements, and usually it requires years to complete them, but when fully completed the city possesses a work of the greatest possible utility. In studying the topography of our city we find that the natural summit lies very nearly in a line, the direction of which is as follows: Beginning at Woodland avenue near Eighth street, thence running in a southwesterly direction to Ninth street, following the same, westerly, to Locust, south to Tenth and west to Grand avenue, northwesterly to the corner of Ninth and Walnut, southwesterly to the corner of Twelfth and Main streets, thence northwesterly to

* Read before the Kansas City Academy of Science, January 27th, 1880.

Eleventh and New Delaware streets, thence westerly following the direction of Eleventh to Washington street, southwesterly to the corner of Summit and Lykins, thence in a southwesterly direction following the summit of the bluff.

South and east of this line we find that nature has formed a large basin into which the rainfall from the surrounding hills and country flows, embracing an area of nearly fifteen hundred acres. This area is considerably less than the actual area drained by the natural water courses that stretch out in a great variety of directions in their meanderings through deep ravines and gentle slopes of surrounding hills. North of this line, the greater portion of our rainfall, or storm-water, seeks the Missouri River; that is to say, the general inclination of surface is toward that stream. South of it the storm-water seeks the lower levels of this natural basin. The question naturally presents itself, "How can this basin, covering so large an area in our city, be relieved of its waste and natural drainage? Two methods have suggested themselves to my mind, and I have also heard a third method discussed by not a few of our representative men, which has not to my knowledge received a great degree of encouragement. Of this I speak first.

The plan referred to suggests the conversion of O. K. and Turkey creeks into an outlet or main sewer, discharging its accumulations of filth into the Kansas River at its present junction with Turkey creek. There can be no question as to the apparent lack of merit in this plan, which has not the slightest indication of permanent utility, and I question whether the advantages gained would, under any circumstances, balance the evils generated by its execution, or recommend it to any thoughtful and cautious engineer or intelligent citizen.

It is true that such an outlet would convey away the waste from the houses within the area referred to, but it would discharge its accumulations in a place and condition that would occasion full as great evils as if the waste had been permitted to remain scattered throughout this area. At the place of discharge it will be in a concentrated form, and therefore more dangerous. West Kansas, Armstrong, Riverview, Wyandott and not a small portion of the city proper, would be subject to the evils arising from its decomposition and putrefaction. Kansas River has a very low velocity. There are also jetties extending into the current of the river, large pockets have been formed by the continual falling in of its banks. Behind these jetties and in those pockets sewage will accumulate. We also find another objection in the apparent backing of the water at its confluence with the Missouri River. It meets directly the full force of its current which is certainly a very peculiar feature. This method would occasion the passage of the sewage entirely around the city.

We cannot estimate the evils that will necessarily arise and become constant during its passage. To my mind, by the execution of this plan a permanent evil will be established, and the rate of mortality materially increased. In place of this method I would suggest the building of a main outlet sewer, making the capacity of discharge equal to a circular sewer twelve feet in diameter, beginning south of Twentieth street, near Main, and following the general direction of O. K. creek, straightening it, however, in many places, to a point near the junction of

Turkey creek, thence curving to the right or northwesterly, to the east side of the last mentioned stream, straightening it, also, in several places, and thence along the easterly side of the same to the water-works. At this point I would suggest the construction of a large flushing gate, so, if at any time it became necessary to flush the sewer between the Missouri River and the water-works, it could be successfully accomplished by utilizing the water from Turkey creek. By means of a flushing gate water could be admitted into the sewer in as small quantities as may be desired, or entirely excluded; thence following the center line of Liberty street to the Missouri River. This sewer will drain a much larger area than was previously mentioned, having added to it a great portion of West Kansas and the bluff. There is much to be said in favor of this sewer. It will serve as a main outlet sewer for West Kansas, which they must have shortly, and more than two-thirds of our population would be benefited. In the execution of this work it would not be advisable to arch Turkey creek, thereby making it a part of the sewer. It will be far preferable to keep the sewer entirely separate, excluding the water when necessary and using such quantities as may be required in the flushing process.

The approximate length of this sewer will equal about 14,520 feet. The examination that I have made, not with great precision, however, but sufficiently accurate to establish beyond question its practicability, indicates an inclination from the place of beginning to a point near the corner of Fourteenth and Liberty streets of nearly five inches per 100 feet. From this point to the Missouri River an inclination of nearly three and one-half inches per 100 feet is attainable, which is beyond question sufficient to serve the purpose of its construction. The approximate cost of an improvement of this kind would probably be from $225,000 or $235,000, or about fifteen dollars per foot, first class work. The cost will depend wholly upon the nature and class of work.

The other method that suggested itself to my mind, and which I communicated to Mr. Knickerbocker, city engineer, during the summer months, who thought favorably of it, is to tunnel through the hill that sepraates the natural basin on the south from the Missouri River on the north. The tunnel will pass directly under the city. The word tunnel, associated with an improvement of this kind, suggests to the mind an extensive and costly work, but in this improvement there will not be so great cost associated with its execution as one naturally supposes.

The tunnel will have a capacity of discharge equal to a circular sewer twelve feet in diameter, through which all sewage and waste from the houses within the area mentioned will pass. There are three routes by which the Missouri River can be reached by means of sewer tunnels. First—Beginning at a point south of Twentieth street near Main, thence to Twentieth, following the same to Cherry street. Thence diagonally under the Fair ground to Ninth street, between Tracy and Lydia avenues. Thence, following as near as possible the ravine, passing under Independence avenue to the river. A considerable amount of work on this route will be open trench work, but the greater proportion will require tunneling. Second route—It is proposed to follow the same route as the former to the corner

of Charlotte and Nineteenth streets. The tunnel will follow the general direction of Charlotte street to Ninth between Charlotte and Holmes streets, thence following as near as possible the direction of the ravines north of Ninth and Independence avenue to Gillis street, thence to the river. There will also be open trench work in this route. Third route—This route begins south of Twentieth street on Main, and follows the general direction of Main street to the Public Square, diagonally across it to Third street, 200 feet or more east of Grand avenue, thence north to the river. I consider this route preferable to the others. In the first place it is shorter and will cost less; secondly, it will at the same time serve the ends of drainage fully as well as the others. The approximate length of this sewer will be 9,017 feet, having an inclination of six inches per 100 feet. At the corner of Twelfth street and Main, the bottom of the tunnel will be 134 feet below the surface. At the corner of Fifth and Main it will be sixty feet below the surface. The tunnel will have a length of nearly 7,400 feet. Open trench work will equal about 1,624 feet. It will be necessary to build two ventilating shafts to provide the sewer with as pure air as possible, and reduce the evil effects of the gases. The approximate cost will not exceed $200,000

It will not be many months before an increased population, building houses in that section of our city, will demand improvements of a sanitary character. The accumulations of waste matter in the area of drainage referred to in the early part of this paper will be very great indeed and they must be relieved from the evil effects of that accumulation. It must be conveyed away so that air and water will be free from contamination. This can only be successfully accomplished by carrying it by means of properly constructed sewers to the Missouri River, either by tunneling or such other method as will fully meet the requirements of the population. There are not a few cities in the United States and Continental Europe that have had to resort to the tunneling process to perfect their sanitary improvements. It is the experience of all cities where these works have been completed that it is far better to carry out a well organized system, even though it may cost more in the first stages of the work, than for the sake of economy to establish little local districts to accommodate every property holder that has some wonderful notion of his own regarding the arrangement of sanitary works. There is no economy in work of that character. It is far better not to begin these improvements at all unless they will in the end be a part of a general system.

## AN ENGINEER'S OPINION OF THE TAY BRIDGE.

Mr. E. W. Ives, C.E., a well known member of the profession, who was deputed by a number of London railway engineers to make an independent examination into the causes of the Tay Bridge disaster, has presented his report at a meeting held in London.

In the course of this report, Mr. Ives expresses the opinion that the whole bridge was of far too light and flimsy a character, especially the piers, which also

he considers to have been badly designed to resist the under-pressure to which they were subject. He believes that everything was sacrificed to cheapness and facility of construction, and that, in fact, the outlay was pared down to the lowest possible point. His conclusions as to the causes of the accident are that the main girders were not designed to resist the side pressure of the wind; that the method of erecting them strained the wind ties; that there should have been iron cross girders with proper gussets; that the flooring should have been placed diagonally; that there should have been raking columns; the bracing should have been more solid; the top columns should have been tied together; at least two more columns should have been inserted at each pier, and the main girders should have rested directly over the columns, or have had box girders to distribute the weight over them, and not have rested upon a triangular girder in the way they did. He is of opinion that the wind had, previously to the train entering on the large span of the bridge, obtained such a hold upon the girders as to cause them to oscillate considerably, and that the piers, not having proper bracing, rocked until the bolts parted on the weather or southwest side, and caused the whole structure to collapse and fall over.

Mr. Ives, in conclusion, says that, in order properly to investigate the cause of this calamity, the whole of the girders, together with the engine, tender and carriages, should be bodily lifted by means of pontoons, though, if necessary, the girders might be cut into lengths under the water.

It may be stated that Mr. Ives, who has made the above report, is well known as the constructor of several important engineering works, among them being the erection of the unique and immense roof of the Lime Street Station, at Liverpool, covering the largest area of any station in England; the roof at Woodside Station; the Metropolitan Railway works; the bridge near Farringdon Street, and the whole of the large bridges on the Central Railway stations to the Manchester.

—*Oldham Chronicle.*

## TURNING SAHARA INTO A LAKE.

It seems that the conversion of the Desert of Sahara into an inland sea might not, after all, be so much of a blessing to the continent of Africa as was claimed when the project was first broached. At a recent meeting of the French Geographical Society at Paris, Dr. Cosson, a member of the Institute, combated the scheme with numerous arguments He did not believe the climate of the interior of Africa would be changed by the artificial sea Its shores would be as arid as those of the Mediterranean in Tripoli; but, if the climate should change, the date crop, which is the principal support of the natives, would be ruined. The routes of the caravans from Tunis and Algiers to the interior would also be destroyed and the whole inland trade degraded. Dr. Cosson also predicted that the mass of water would produce perturbations in the subterranean currents which feed the artesian wells in the oases, and might cause them to fail, and thus entail the loss of hundreds of thousands of palm trees. His views as to the climatic influence of a Saharan Sea were opposed by other members of the society.

# EDUCATIONAL.

## THE VESTIBULE TO SCIENTIFIC STUDIES.

BY PROF. T. B. SMITH, NORTHFIELD, MINNESOTA.

In all of our teaching, we are too much given to putting a text-book into the pupil's hands and bidding him prepare so many pages for the first lesson. I have become assured that this is not the right course to pursue, and, therefore, at the entrance of each class on any particular branch of learning, I spend a lesson or more, as the case may need, in going as far back as possible and bringing them up to the topic in hand. In this article I shall endeavor to state briefly the method pursued with classes beginning various branches in Natural or Physical Sciences.

It is easy to start with a single thought and unfold it until it becomes very complex; but, if done in the right way, the whole course will appear easy and plain. But to begin with something far removed from the starting point, and try to go ahead without any knowledge of what is behind, is very difficult indeed. If you start at the front door and proceed to pass through the hall and up the stairway, and through the vestibule and over the threshhold into the audience room, then it will be easy to go ahead or to go backward, and there is no sense of bewilderment; but if you be blindfolded and set down at once in the audience room, then you do feel bewildered, for you know not where you are, nor how you came there, further than that you were brought there, nor what is to come.

Let us call any particular branch of Natural Science the audience room; then let us see what constitutes the vestibule through which the pupil must be allowed to pass if you would have him understand clearly where he is and what he is doing.

The first great and fundamental thought is, Our study is to be about matter as it is, as we have been familiar with it all our days. We are not to bother ourselves about its origin or its destiny; neither are we to concern ourselves with Mind. Matter, and all its form and phenomena—these are to be our study.

But Matter is not permanent—it is always changing so far as we can see. So the second great thought is Change.

But there is, as we have learned by experience, always some cause of the change; and these Causes constitute the third great thought.

Summing up what we have thus far learned, we find we are to study and learn about these things:

1. Matter and its Forms.
2. Changes in Matter.
3. Causes of these Changes.

Then follow definitions and divisions of these topics.

I. MATTER.—Matter is that which occupies space and prevents anything else from occupying the same space at the same time. There are large bodies of matter, as the sun, moon, mountains, etc. These are known as *Masses*. Of course, these masses can be divided and subdivided to an apparently unlimited extent. Thus, by heat, water is changed into an invisible vapor; and, by electricity, it is changed into invisible gases. But there is a difference between the invisible forms obtained in the two cases. If the heat be taken away, the vapor produced by it will cool down and again resume its original form; but the gases produced by electricity are permanent—they do not again become water when the electricity is removed. We conclude, then, that the state of division reached by the heat was the finest possible without altering the identity of the water. Such divisions are called *Molecules*, from the Latin word *moleculis*, meaning *a little mass*. But the state of division reached by electricity, by which the identity of the water was altered, must have been finer than the molecules. And, since these particles finer than the molecules cannot be subdivided any farther by the forces at man's command, they are called *Atoms*, from a Greek word meaning *uncut-able*, or *indivisible*.

Then we sum up, in reference to Matter, that we know it in three different forms:

*a*. Masses.
*b*. Molecules.
*c*. Atoms.

II. CHANGES.—As we just now said, in changes identity may be affected or it may not be. So we may classify changes under two heads:

*a*. *Chemical*, or such as result in loss of identity.

*b*. *Physical*, or such as do not result in loss of identity, but only affect position, state of rest or motion, condition, as gaseous, liquid or solid, etc.

III. CAUSES OF CHANGES.—Whatever causes change of any kind is called *Force*. We do not know anything about absolute Force; but that is the name we give to whatever causes change. Now Force receives many names, according as it exhibits itself in one way or another; and, without stopping to discuss these "forces," as we call these various exhibitions of Force, we arrange the following classification of them:

1. *Attraction*, which, since it is seen acting between Atoms, and between Molecules, and between Masses, may be divided into three heads:

*a*. Atomic, usually called Chemical Affinity.
*b*. Molecular, subdivided into Cohesion, Adhesion, and the Crystallic Force.
*c*. Cosmical, usually called Gravitation.

2. *Phenomenal*, or such as affect our senses, as Heat, Light, etc.

3. *Biologic*, or *Vital*, or *Life Force*.

Many of these forces can be changed from one kind into another and not one jot of energy be lost; and it is possible, even probable, that most if not all of them are only modes of motion—modes of that motion originally imparted to

matter when "God moved upon the face of the waters"—*i. e.*, the elements of matter.

Thus far we have been getting together the materials with which we are to work. We have now before us Matter and the Forces which act in and on Matter producing changes. Let us, therefore, next endeavor to discover the order in which these changes naturally occur.

In our thought let us go back to "the beginning" of which the Bible speaks. We believe there was a beginning, though we may be wrong. Huxley says: "Any human belief, however broad its basis, is only a probable belief; our broadest generalizations are simply statements of the highest probability."

Now if the simplest form of matter at the present time is the *atom*, then "in the beginning," before molecules and masses were formed, all matter must have been in the atomic condition. These atoms were distributed through all space, and were at rest, unaffected by any force save, perhaps, that universal force whose laws the immortal Sir Isaac Newton formulated—the Attraction of Gravitation, which we have termed the Cosmical Force.

With the idea of Atoms, *at rest and universally distributed*, clearly set before us, then the next question is, How did these atoms get together to form molecules? Well, we may make several hypotheses, which may or may not afford explanation.

First, let us say, the Creator endowed these atoms with peculiar affinities, such that there was immediate attraction between them, and they began rushing together.

Secondly, let us say, the Creator "moved upon the face of the waters," and the atoms rushed together, impelled by peculiarities in "mode of motion."

Thirdly, let us say, the Creator endowed these atoms with peculiar affinities, and then set them in motion, when they at once began to rush together, impelled by these inherent affinities and peculiarities in "modes of motion."

Any one of these may afford the true explanation, but we do not really know. So, since we must make assumptions anyhow, let us not try to offer explanation, but proceed to say that, "in the beginning," the primal form of matter was the Atom, the first active force was atomic attraction, or chemical affinity, and the first result of the interaction of these was the formation of Molecules, in which were seen none of the original properties of the atoms, but entirely new properties.

In these steps we have run one complete round in the transitions of Matter, and hence have set the bounds for what we shall call Kingdom I.

Now, if we take Kingdom I, its atoms, chemism and molecules, and introduce molecular attraction, the result will be masses of matter varying in size from two or more molecules to those huge and wonderful aggregations we term stars and worlds. Molecular attraction exhibits itself in more than one way. If it acts between molecules of the same kind, we call it Cohesion; if between molecules of different kinds, we call it Adhesion. It is a noticeable fact that under some circumstances this molecular attraction causes molecules in their aggregation to as-

sume particular shapes, with well defined angles, called Crystals. To this phase of this force we assign the name, the Crystallic Force. Whether it be a variety of cohesion, or cohesion acting under the direction of a higher force, we do not know.

Both atomic and molecular attraction are influenced, modified and overcome by other forms of force which we have termed the phenomenal, the most important of which in this respect is heat. In the combined action of all the forces thus far mentioned we are to find explanation of the gaseous, liquid and solid conditions of matter and the various specific properties of them. Now we have reached the limit of form and change in dead inert matter and therefore have found the bounds for another kingdom which is Kingdom II. If we take Kingdoms I and II, their atoms, molecules and masses and all their forces, and introduce among them a force called the vital or life force, we have as a result, all the myriad forms of beauty seen in plants and animals.

Like a skillful leader coming into the midst of forces, splendid yet uncontrolled, life comes into the midst of matter and its forms of force, and lo! What evolutions and revolutions! How mightily it sways the scepter of control and bends all under its authority! Yet all the while unconquered powers, only held in temporary abeyance, bide their time and, at the slightest surcease of vigilance on the part of the general, break out and revel in wild riot and ruin. In the forms resulting from the action of the life force, we reach the acme of change in matter. There is nothing beyond this in the material world of which we know aught. Hence we have set the bounds for Kingdom III. Beyond this kingdom there are forces acting in matter, as the mental, the spiritual, the intellectual, but their result is not material and hence we have nothing to do with them. They are beyond the limits of material science. We would only throw out this thought in passing. There is a well known fact learned in the study of Geology, that the life of each historic age gives promise of what is to be in the age succeeding it. So we love to think that the life of man gives promise of a higher and spiritual order of things in the time to come. And from all the beautiful order we have seen in the study of matter and its evolutions, we can not help believing that God's wondrous purposes have had and will continue to have fulfillment in the mighty course of ages.

To study matter further, then, we must take a new material unit, and this shall be our Earth. We study it with reference to the entire contents of Kingdoms I, II and III. By confining ourselves to its exterior and the relations of the land, the water, the air and the living beings, we make limits to our Kingdom IV. But if we go down into the interior and try to find out its birth, growth, history and age, then we call that Kingdom V. And now that the Earth has been ransacked, if we would study matter still further, what is left but the region outside the starry heavens, and this is Kingdom VI, beyond which we can go no further. We have reached the limit. We began with atoms, we end with worlds.

Between these two bounds our senses—the lines by which matter sends messages to mind—receive impressions and we learn therein; but beyond them either way, all is hidden. Just as we abide in silence until vibrations numbering sixteen

per second fall on the ear and we begin to hear sound; and we hear on until the vibrations reach about 40,000 per second, when the ear loses its sensibility, and we pass out into silence again. Just as we abide in darkness until vibrations numbering about 400 trillions per second fall upon the eye when we say we see red light, and we see on through all grades of color until the vibrations reach about 700 trillions per second, when the eye loses its sensibility also, and we pass out into darkness again. Thus we move in little circles of matter having a beginning and an ending, and thus we must be content in our study of matter, to labor within the limits assigned. And why not? Surely this will give us all we can do. In summing up we find there are six kingdoms in material science, viz:

Kingdom I, which deals with atoms, atomic attractions and molecules, and which in the schools is named CHEMISTRY.

Kingdom II, which deals with molecules, molecular attraction and other forms of force and masses, and which is named PHYSICS or NATURAL PHILOSOPHY.

Kingdom III, which deals with everything under the control of vital force, (so called,) and which is known as BIOLOGY, or BOTANY and ZOÖLOGY.

Kingdom IV, which deals with the Earth mainly in a surface view, and which is called PHYSICAL GEOGRAPHY.

Kingdom V, which deals with the Earth mainly in a subterranean view, and which goes by the title of GEOLOGY.

Kingdom VI, which deals with matter extraneous to the Earth, and goes by the title, ASTRONOMY.

Now all the various branches of material science found in any of our schools may be placed in one or other of these six kingdoms. For instance, Human Physiology belongs in Kingdom III, subdivision Zoölogy; while Meteorology belongs in Kingdom IV, subdivision "Earth in Parts," section "The Air."

I have the whole subject mapped out upon a large chart on which the six kingdoms make a complete circle. As an example of how each kingdom is presented, take Kingdom IV, or Physical Geography:

- PHYSICAL GEOGRAPHY
  - Earth Entire.
    - Celestial. — In Universe, In Solar System.
    - Terrestrial. — Forms, Density, Magnetism, Etc.
  - Earth Divided.
    - Land. — Continents, Islands.
    - Water. — Fresh, Salt.
    - Air. — Meteorology, Etc.
    - Life. — Vegetable, Animal.

This occupies about one-sixth of the circle, the other kingdoms occupying about the same respectively.

Such is the vestibule through which classes in Natural Sciences are inducted into their particular branch by the writer, who has found it great gain so to begin.

# ZOOLOGY.

## ZOOLOGIZING IN THE MAMMOTH CAVE.

BY H. G. HUBBARD, DETROIT, MICHIGAN.

During the past summer, while acting as entomologist to the Kentucky State Geological Survey, I made, at Prof. Shaler's direction, repeated examinations of the limestone caves in the vicinity of Pennington's Gap in the Cumberland Mountains of Lee County, Virginia, without, however, finding a specimen of any true cave insect, except a cricket (*Raphidophora*). Being dissatisfied with this negative result, and anxious to test my powers in a locality known to be inhabited by blind insects, I determined, on my return, to make a short visit to the Mammoth Cave. Accordingly, on the 19th of August, in company with one other member of the Survey party, I found myself in the stage-coach, rapidly traversing the ten miles of hilly country that intervenes between the railroad at Cave City and this world-renowned cavern. We reached the hotel about six o'clock in the evening, and, after supper, joined a party which we found about to take "the short route," a tour in the cave three and a half miles, and the same distance back, making a walk of seven miles.

We entered the cave, the mouth of which is a little hollow behind the hotel, and, after proceeding about two hundred yards, found ourselves in a very large chamber called the Rotunda. Here two avenues lead off, one to the right, the other to left. The left-hand turn is takeu by all parties making either the "long" or the "short" route, and to the Rotunda they must always return on the way out. The passage to the right is an immense gallery, like a great tunnel, eighty feet wide and forty feet high, and about three miles long. It is called Audubon Avenue, and has but few branch galleries, none of them very long. The first side passage that leaves Audubon Avenue is a mile long, and opens at its end into the top of Mammoth Dome. So one may follow this passage to eternity, by stepping from the top to the bottom of Mammoth Dome, a distance of two hundred and fifty feet.

As I was anxious to begin at once my acquaintance with subterranean life, I decided to remain behind, leaving the guide and his party to continue their route, and arranging to meet them here in the Rotunda on their return at eleven o'clock. I watched their fading lights and listened to the rapidly diminishing sound of their footsteps as they receded down the long passage, then turned into Audubon Avenue, and, following previous instructions, found and traversed to its end the side passage leading to the jump-off into the dome. The gallery was, however, very dry, and, after careful search, finding no insects, I lost no time in returning to the Rotunda. This is also a dry chamber, but in a few places the walls are slightly

moist, and there are ledges upon which the droppings of bats are collected I found at last, on one such moist shelf, a little pile of fresh bats' dung, and, on disturbing it, three or four specimens of *Adelops hirtus* ran swiftly away and hid in the cracks, or in the shadows of small projections of the wall, as though they perceived and shunned the light of my lamp. Their manner was exactly that of a *Catops* when similarly disturbed.

* * * * * * * * * *

The next morning my friend N. and I returned to the Rotunda, and found a fresh supply of Adelops, where I had taken them the night before. Other and better ledges also turned up, and we secured in all about thirty specimens of beetles. While examining the side walls, a small patch of clay, adhering to the rock, attracted my attention by its lumpy appearance, and, picking at it, I opened a small pupa, evidently of Adelops. This was a grand discovery, and, while N. made a search for other lumpy patches, I carefully uncovered four cells, all that were found together in this piece. Each cell contained a pupa and I collected them, with the skins of the larvæ. Near by I found another and a third cluster, and N. found one or two more, all within a foot or two of the floor. The number of cells in each cluster varied from four to twelve. One cell inclosed a larva, and two or three others contained recently transformed imagos of *Adelops hirtus*.

* * * * * * * * * *

Nearly every part of the Rotunda is dry and devoid of life. The corner in which the Adelops occurred had, however, a slight cave dampness, and so well repaid our search that we devoted the greater part of the morning to examining this recess alone. The carcass of an ox lay here close to the wall and partly buried beneath a heap of stones and earth, though long past the stage of putrefaction—if, indeed, the ordinary process of putrefaction ever takes place in the pure air of the cave—and entirely odorless, the flesh still adhering to the bones in a wet and moldy condition, communicating its moisture to surrounding objects. Upon pieces of wood and boards that lay upon this heap, and were thus kept perpetually moist, we captured seven specimens of *Campodea* and four of *Machilis*, both of which, though blind, had the habits of their relatives, the Bristletails and Poduras, also, five specimens of the blind Pseudo-scorpion (*Chthonius Packardi* Hagen, described and figured in the second part), and two specimens of a transparent and delicate *Psocus*, with small eyes and rudimentary or undeveloped wings. The last is, perhaps, a wanderer from without, but the three former are blind and colorless, true cave forms. The larger cave fly (*Anthomyia*) was common about the ledges, and a single specimen of *Anophthalmns Menetriessii*, which presents an extreme amount of variation, was discovered, after much searching, deeply hidden in a crevice four feet above the floor.

* * * * * * * * * *

At noon my friend left me and returned to the hotel. I was too much excited to interrupt this, my first acquaintance with a true cave fauna, and momentarily expected to find a new beetle or to make some other grand discovery. I left

the Rotunda and proceeded along Audubon Avenue perhaps a quarter of a mile, to the first sharp turn. Here I heard water dripping at the summit of a long hill of loose rock which rose before me to the roof of the dome. Up this I climbed until I reached the spot upon which the water fell. Most of it sank at once between the rocks and disappeared, but accumulations of sand here and there retained shallow pools, and formed tiny beaches among the fallen fragments. The wet sand was seen at the first glance to be covered with the tracks of insects, as if the hillside swarmed with life. And, in fact, crickets (*Raphidophora subterranea* Scud.) and their young were quite numerous upon the wet stones, although they were congregated in still greater numbers upon the side-walls and roof. Almost the first stone I turned over uncovered an *Anopthalmus*, but it fled like a shadow into a crevice and saved itself. Three or four others, however, shortly fell into my clutches, and then during an hour's hunt I could find no more. My movements had, I suppose, frightened the rest and caused them to seek shelter in the cavities below. I took, however, two specimens of a minute blind spider (*Anthrobia*), which were running upon the sand. I next turned my attention to the pools of water, and, though none of them were larger than an ordinary wash-bowl, I found them all veritable little aquaria, well stocked with the Crustacean described by Packard (*Cœcidotea stygia*). Some of the pools contained twenty or thirty specimens, in all stages of growth. In company with them occurred, not rarely, a leech, or possibly worm, of very slender form, not thicker than an insect pin, but capable of extending its delicate body to a length of two inches. Being almost transparent, these creatures were rendered visible by sheir shadows only.

* * * * * * * * * *

The following day we resolved to visit the River Styx, which is the lowest level of the cave and about three miles from the entrance by the route usually taken.

* * * * * * * * * *

Arrived at the point where the River Styx crosses the gallery, we found Charon's boat drawn up upon the sand, and, depositing our burdens, we began a search along shore for blind fish and crawfish. The forms of several were soon seen floating like white phantoms in the almost invisible water, and we captured with an insect net several small specimens of both genera of blind fish, *Amblyopsis* and *Thyphlichthys*, which resemble each other closely, but want the ventral fin in the atter genus. We took, also, good specimens of the cave crawfish (*Cambarus pellucidus* Tellk.), and, in addition, a gigantic female of *Cambarus Bartonii*, the common crawfish of the Green River, but which has quite often been found in the cave waters. A very unexpected find, however, was a common frog. He was restinh upon the sand not far from the water, and was somewhat emaciated and apparently much discouraged. A fish with large and perfect eyes, probably a darter, showed itself in one of the large pools. It remained for some time motionless at the surface of the water, within easy reach, but "Pete," our guide,

missed it with the net, and it vanished in a twinkling, not to appear again. A single *Anophthalmus*, found running on the sand, was the only insect, except crickets, seen here.

When, therefore, the party we had left at the hotel in the morning, and who had started later in the day by the long route to the end of the cave, arrived, we decided to accompany them farther. We embarked with them in one of the boats, and, leaving the gallery on our left, pushed under a low, wide arch, and floated for half a mile in an aqueduct, like a mammoth sewer, over water thirty or forty feet deep. The guides, standing up in the bows, propelled the boats by pushing with their paddles against the low roof. At its end, the river sinks beneath the wall of rock, but another great gallery opens here at the side, and another system of halls and avenues begins, the farthest point of which, and the end of the "long route," is still a walk of six miles from the river.

We landed and hurried on before three miles farther, to Washington's Hall, a chamber of the largest size, and for many years the luncheon place for tourists. The floor of the hall is of white gypsum sand, strewn with fragments of the same material. The larger masses of gypsum afford convenient seats and tables for picnickers, and are strewn about with chicken bones and bits of food. The accumulation of such *rejectamenta* is very great; to be reckoned, perhaps, by the cartload; yet, notwithstanding the presence of so much offal, kept perpetually moist by contact with the gypsum sand, not the slightest taint is perceptible in the air of the chamber; only at close quarters the recently deposited morsels give off a peculiarly rancid odor. As before in the Rotunda, I was struck with the conviction that decay in the cave is an exceedingly slow process, accomplished mainly through the agency of a few fungi.* Prof. Tyndall has shown that in the pure atmospthere of the Alps, perishable infusions of meat and vegetables remain unchanged for an indefinite period of time.† May it not be that the equally pure and bracing air of these caverns is likewise comparatively free from the germs of Bacteria, Vibrios and other agents of putrefaction? It has been asserted, by the guides, that meat hung up "at the mouth of the cave" will keep fresh a long time. ‡

But, if Bacteria are absent, other scavengers in abundance attack this food material. I found it swarming with larvæ of Adelops and the maggots of a small fly (*Phora*). The imagos of the beetle and the puparia of the fly were also present in countless numbers. The adult beetles were very agile, and, on being dis-

* The fungi of our caves have not, as far as I know, been studied. Two species have been identified by Dr. Farlow from the Mammoth Cave, *Ozonium auricomum* Link, the mycelium of an unknown fungus, and *Stemonitis ferruginea*, also immature. A list by Pokorny, of fungi from the Adelsberg and Lueg caverns, Germany, extracted from Dr. Ad. Schmidt's "Die Grotten und Hoehlen von Adelsberg," Wien, 1854, and kindly sent me by Dr. Hagen, enumerates nineteen species, all found above ground, and originating, as Pokorny thinks, from spores introduced from without on wood.

† For an account of these experiments, see *Popular Science Monthly* for February, 1878.

‡ During the summer months, when the temperature outside is higher than that of the cave (59° F.), a strong current of air flows out of its mouth. The incoming supply is said to be by filtration through the rocks, in which case it would be, very probably, freed of floating germs.

turbed when gathered in a cluster about a piece of meat, they scattered in every direction over the sand, so that it was difficult to pick them up rapidly. I found the best method to be to throw the lump with Adelops clinging to it on to a handkerchief. The beetles then hid in the folds of the cloth, and could be picked up by a quill passed through the cork of the collecting bottle. In this way we secured several hundred specimens in a few minutes. To secure a good supply of larvæ, it was sufficient to tie up in a cloth one or two small fragments of chicken bone crowded with insects. These, unfortunately, remained forgotten in my collecting sack until after my return home, a week later, when I found and examined them. They were much crushed, and the larvæ all dead, but, of the twenty or more Adelops which adhered to the lumps, and had been imprisoned with them, two were still alive. Both, however, died after another week's confinement. Some of the puparia of the fly were also uninjured, and in a few days several perfect Phoras made their appearance from them. Three or four living mites (*Acarus*), and a very minute Psocid (*Atropos divinatoria* Muell.), possessing eye-spots and undeveloped wings, were also found upon the lumps. Washington's Hall was said to be a good locality for Anophthalmus, but we found only a few specimens under flat pieces of gypsum.

The party of sight-seers had, in the meantime, gone to the end of the cave, and a few minutes before their return "Pete," who had remained with us, proposed to take us to a place where plenty of Anophthalmi could be found. He then led us back a short distance to a passage called Martha's Vineyard. Here the rocks are damp, with some dripping springs, and one quite large pool known as Hebe's Spring. This locality did not disappoint our expectations. It is one of the best in the cave; but, as we had but a few minutes' time, we were obliged to hurry over the ground and could delay but a few moments in one place. The guide, constantly moving on, called back to us that it was dangerous to fall behind. At Hebe's Spring, the repairing of a stairway left the timbers of the former structure scattered about, and under these, *Anophthalmus Tellkampfii* and *A. Menetriessii* were common, the former much more abundant than the latter, however. I found here, under a piece of wood lying on sand, a specimen of a larva which agrees perfectly with Packard's figure of that of *A. Tellkampfii** We also secured two specimens of *Phrixis longipes*, the blind Phalangid spider, or Harvestman, described by Cope.†

With a little more time at our disposal, I feel sure that the pupa of Anophthalmus would have been found at this spring, as many of the imagos taken were quite fresh. The pupa has, however, already been figured by Packard in his paper on the beetles of the cave. While I devoted myself to hunting under boards and stones for other insects, taking only an occasional specimen of Anophthalmus, "Pete" and N. were capturing numbers of the latter, all of them resting in exposed places upon the side-walls, where it was quite damp, and usually several feet from the floor. They were not at all difficult to find or to capture, and we took about thirty

* American Naturalist, vol. x, pl. ii.

† Ibid., vi, p. 421.

specimens while rapidly passing over the first half-mile of our route back to the river. * * * * * * * * *

In examining the results of my two days' collecting, I find, in forty specimens of *Anophthalmus Tellkampfii*, but little variation. Of twelve *A. Menetriessii*, three show considerable variation in size and form, and one is plainly pubescent. An undoubtedly new species of this genus has been detected among the specimens of the latter species, which I have named *A. interstitialis*. A small mite (*Acarus?*) infests the bodies of the Anophthalmi. While studying the larva of the *Adelops*, and observing the action of the muscular lobes that close the rectum at the end of the anal tube, by pressure I succeeded in expelling the fœces in ovoidal masses, and along with them several thread-like bodies, curved in the shape of a fish-hook and pointed at the ends. Under a magnifying power of 250 diameters, they appear to be filled with granules, and are thicker and shorter than *Trichina spiralis*. I suspect that they are intestinal worms.—*American Entomologist.*

---

## FISH CULTURE IN THE WEST.

The proposition now before Congress to appropriate $20,000 to enable Prof. Baird and others interested in the artificial propagation of fish to make an exhibit of American food fishes at the International Fishery Exhibition, to be held at Berlin, in April, will at least have the good effect of turning public attention, in this country, to the vast and growing importance of the subject of pisciculture. We do not know that we would gain anything directly by sending our samples to Germany, but as the superiority of our methods would excite remark and stimulate inquiry at home as well as abroad, we might in the end reap a reward in the growth of public interest in this question and the increased willingness of our legislative bodies to make the necessary appropriations for the artificial propagation of food fishes. Wonderful progress has been made in re-stocking waters partially or wholly depleted of fish in many of the Northern States. Artificial propagation has been practiced successfully for many years in the production of salmon and codfish in the New England States, and every spring, millions of the young of these species are turned out of the hatcheries into the bays that indent the eastern coast of Maine, Rhode Island, Massachusetts and Connecticut. Nor have the streams of that region been neglected. Rivers and creeks that for generations had been without fish, have been re-stocked, and thus new and, with proper care, inexhaustible supplies of excellent food have been added to the resources of these States.

The States bordering on the great lakes have for years pursued a most liberal policy in the matter of fish culture. Thirty years ago, Lake Michigan was crowded with the far-famed whitefish, but the eager demands of commerce and the untiring industry of the fisherman made such vast inroads upon the species that it was threatened with utter extinction. About five years ago, at the urgent solicitation of a few naturalists who saw the danger and its remedy, the Wisconsin

Legislature provided for the establishment of a fish hatchery at Milwaukee. Under competent management, the institution has proved a great success, and every year from 10,000,000 to 20,000,000 of young whitefish are turned into Lake Michigan by the hatchers. Careful observations show that the young fish thrive wonderfully, and it will not be long until the supply of commercial whitefish will be greater than ever in Lake Michigan. The same hatchery also turns out millions of lake trout every year. This is a much hardier fish than the whitefish, and its growth is very rapid, but it is not so highly prized as its more delicate neighbor. Within the last two years the propagation of land-locked California salmon has been attended with gratifying success at the Milwaukee hatchery, and it is thought that this valuable fish may become acclimatized in the waters of the Mississippi Valley.

In Michigan, Minnesota and Iowa, as well as Wisconsin, much attention has been paid to the propagation of brook trout, and the cold-water streams of these States are gradually being stocked anew with that delicious fish. It has been found, by experiment, that the whitefish and the lake trout of the great lakes will thrive and increase in the inland lakes of the Northern States which have a depth of fifty feet. These species could hardly be expected to endure the greater warmth of our Missouri summers, but there are others which can be propagated with equally gratifying results, that would, if placed in our running streams and small lakes, add greatly to the natural wealth of the State by vastly increasing our supply of cheap and wholesome food. No State can be too liberal in dealing with this question. There is no other form of animal food that costs so little as fish, and very few that are so nutritious and desirable. We have many streams in this state that might be stocked with food-fishes adapted to our climate at small expense. We are glad to note that our Fish Commissioners are alive to the importance of this subject. They have recently stocked a few streams with young fish procured from Wisconsin, and we have no doubt they would accomplish much more if they were not hampered by the want of funds. We trust that the next Legislature will make up for the shortcomings of the last in this matter.—*St. Louis Globe-Democrat.*

---

# PHYSICS.

## CAUSES OF ARTESIAN WELLS.

It has been reported that at Champaign, Illinois, an inexhaustible supply of water has been discovered twenty-seven feet below the surface, and that, on being probed, it overflows at the surface of the earth. Quite similar instances, in various parts of the country, have been numerous. The phenomenon proceeds from the same general cause that sends the millions of springs of water bubbling forth through superficial crevices, and makes some wells constantly overflow. The in-

fluence which produces such action as this is the resultant of the earth's centripetal and centrifugal forces operating impulsively upon the subterranean water deposits, and forcing them into and through the natural channels of the earth's crust. The theory that the water flows to these springs and wells from a higher point, by hydrostatic pressure, is ably contested by a writer in the *Popular Science Monthly*. If the immense floods which break forth in different places were the result of a flow from some other higher bodies of water, the drains must have of necessity sooner or later exhausted the supply sources, unless equivalent streams were flowing into the latter also. Next, whence could come the higher heads to flow into and supply them in turn? Extend the process until a flow is secured from the highest land on the earth, and then whence comes the flow to supply that?

At Grenelle, Germany, a majestic column of warm water rises thirty feet above the surface of a well 1,000 feet deep, for which there is no apparent head. The artesian well at Tours rises with a jet that can sustain a cannon. Chautauqua Lake rises like a jewel in the crown of a high mountain ridge. It is twenty miles long and two miles wide,and is fed by innumerable springs which can be seen bubbling up through the bottom. It is on the highest land in the State of New York west of the Catskill Mountains. From it issues a large mill stream. To account for this great flow in this region by supposing it to fall from some other higher elevation is absurd, for there is no such source from which it could flow without being exhausted.

In the mountain region of Pennsylvania, at every step, the traveler notices abundant streams of the purest water, sometimes gushing from the very tops of the mountains. There is no land above them from which such torrents could flow in such constant abundance.

Lakes Superior, Ontario, Huron, and possibly Michigan, are overflowing springs of subterranean water, but they cannot be accounted for upon the hypothesis of hydraulic pressure,since there are no higher lands which could furnish an adequate supply. If all the lands on the continent which are higher than Lake Superior were supposed to be but shells filled with water, the difference between outflow and the inflow of Lake Ontario would quickly exhaust the supply. The vast surface of Ontario cannot come through an underground channel connecting it with Superior, for the difference in level between the two is 365 feet, and were they connected their surfaces would find a common level.

Lastly, from the highest point of the highest mountains in the world—the Himalayas—great cataracts and streams have poured, and still do pour, with an abundance that not only is astonishing, but would exhaust any possible reservoirs at their extreme tops. The conclusion is inevitable that some other force than hydrostatic or hydraulic pressure exists to which these great overflows are due. Gases are out of the question, for they force water down instead of up, when both are inclosed in a common reservoir.

In the case of water imprisoned within the earth's rocky chambers, the resultant of the two natural forces, centripetal and centrifugal, will be duplicated

upon every point of the rock-prison. The intensity of the resultant will be represented by the aggregation of the resultants of all the particles of water. Suppose a small opening be made in the rock-prison. Immediately the water will be forced out with a velocity equal to the influence of these aggregated resultants, modified by the laws of friction, and this velocity will not be influenced by the direction of the original impulses given to the water particles. Hence, if fissures exist in rocks that lead to imprisoned waters, it would happen that through these outlets the waters must certainly flow. If by any artificial means, as by boring, an opening should be made between a body of confined water and the surface of the earth, a flowing well would result. The intensity of the centrifugal force will increase with the distance from the earth's center, while gravity decreases. Thus we find the strongest and most abundant flows at the tops of mountains or on high plateaus.

But, suppose that it had been fully proved that a particular overflowing well or spring was caused by hydrostatic pressure, it would still remain to be accounted for how the water got to that higher point. This can best be done by the force designated, which is always acting upon the partially confined water-beds and water-channels forming the internal water structure of the earth's crust.

---

## THE AURORA BOREALIS.

PROF. G. T. TEMPLE.

Although the conjecture was hazarded more than 160 years since by Halley, that the aurora borealis was a magnetic phenomenon, it has acquired empirical certainty from Faraday's discovery of the evolution of light by magnetic forces, as well as from more recent observations, the following extracts are translated from a letter written by Herr Pastor emeritus H. M. F. Esmark, having observed the meteorological conditions attending the display of the polar lights for many successive years: "The aurora is neither seen during extreme cold or northerly winds, but appears when an ordinary arctic temperature is raised by southerly and westerly winds, and is generally followed by snow. In the southeastern part of Norway it seems to be especially caused by southeasterly winds, which are there very moist and rather warm. Its appearance is aways accompanied by a falling barometer. In my opinion the phenomenon is due to the following causes: When a wind laden with warmth, moisture, and electricity comes in contact with a body of cold air, the moisture is converted into snow, the warmth and electricity are thereby released, and the aurora is the result of the disturbances. The northern lights can not occur in very high latitudes, because the warm, moist air is cooled long before it reaches them." In this way Herr Esmark would account for the splendid appearance of the aurora in Northern Norway, where the sea winds, bringing warmth, moisture and electricity from the ocean, are met by cold land winds from the interior. MM. Lottin, Bravais, and Siljerstrom, who spent a winter in Bosekop, in Alten (lat. 70° N.), saw the northern lights 160 times in 210 nights. The most vivid aurora that I ever saw near Alten, was toward midnight on the 12th of November, 1874. The flickering lights played about the masthead so like light

ning that it was difficult to believe they were harmless. We had no snow, however, till the evening of the 14th, as we were entering Tromsoe Harbor, and during the discharges of light the compass needle was wildly erratic. The determination of the chemical elements involved, by means of spectrum analysis, is by no means the least of the numerous scientific results to be derived from Arctic exploration. —*Proceedings of the Royal Geographical Society.*

## A GLACIER IN THE ROCKY MOUNTAINS.

A gentleman, who has during the past two years, traversed the mountains in the vicinity of Leadville, and penetrated almost every one of the secret recesses, informed a *Herald* reporter yesterday that there is, within twenty-five miles of this city, one of the most interesting curiosities of nature—a veritable glacier, presenting all the characteristics of the glaciers of Switzerland, both in magnitude and motion, its progress being gradually down the gulch. The scene of this curiosity is located in the Mosquito Range, about fifteen miles north of the pass. Our informant states that he first discovered it about three years ago, while out on a prospecting tour. It was nearly a mile in length, and at the bottom of the gulch presented a sheer precipice of ice not less than 150 feet in height. Later in the season the place was visited again, when it was found that the mass of ice had melted until at its face it was not more than one hundred feet high, the loss from the surface reducing its length to about half a mile. Again, early the following year the place was visited, and the glacier was found to have regained its bulk, showing that the accumulation of ice and snow during the winter was about one-third its gross bulk. The rocks on the sides of this immense mass of ice show the marks of attrition, proving beyond all controversy that the glacier is in motion. Indeed, the earth at the foot of the gulch, heaved up in great masses, shows that it is gradually moving down into the valley. During the summer, a large stream of water flows from the face of the icy cliff. Our informant is of the opinion that the glacier, as it progresses out of the deep gorge in which it was formed will slowly melt away and it will not last many years. It is out of the way of ordinary travel, and the route to the scene is exceedingly difficult, so that it is not likely to be visited except by prospectors and hunters.—*Leadville Herald.*

# METEOROLOGY.

## MISSOURI WEATHER SERVICE, JANUARY 1880.

PROF. FRANCIS E. NIPHER, WASHINGTON UNIVERSITY, ST. LOUIS, MO.

At the Central Station, January has been very warm, with excess of rain. The normal January temperature is 31.7 °, while the temperature of January, 1880, was 46 °, or 14.5 ° above the normal. In no case during the month did the *mean daily temperature fall to the normal* temperature, and in only six cases did the

daily *minimum* reach this temperature. On only eight days did the daily *temperature* fall below 40 °. The coldest day (31st,) had a mean temperature of 33.5, and its minimum, the coldest of the month, was 22.5. The highest temperature of the month, was 67 on the 11th. In 1864, Engelman observed a January temperature of 72, but the mean monthly temperature was 29 °, the coldest temperature of that month being minus 22.5. Not only has the past month been 5 ° warmer than any other January in forty-three years, but it has been very uniform Vegetation near St. Louis is, nevertheless, little affected, and the fruit buds are, as a rule, safe as yet. The silver-maple is reported in bloom at Allenton, (St. Louis county). In the southern part of the state, vegetation has been advanced, and may receive injury from future cold weather. The rainfall has been least, (less than one inch,) in the extreme northwest, and in the large area drained by the Osage and Gasconade rivers and their tributaries, and extending up the Missouri as far as Glasgow. In the extreme southwest, the rainfall has reached between six and seven inches. Marble Hill, (in the southeast,) reports three inches of snow on the 12th, but at no other station has the snowfall of the month exceeded one-tenth of an inch.

---

## KANSAS WEATHER REPORT FOR JANUARY, 1880.

BY PROF. F H. SNOW, KANSAS STATE UNIVERSITY.

The warmest January, and, except December, 1877, the warmest winter month in our thirteen years' record. The month was also remarkable for the entire absence of snow, and the unprecedented number of fogs. The high temperature has caused many insects to come forth from their winter quarters, including bees, flies, beetles and moths. Our fruit-growers should search for and destroy the wingless females of the canker-worm moth, which, in a few localities, are now depositing their eggs upon the apple trees.

Mean temperature, 41.23 degrees, which is 14.84 degrees above the average January temperature of the twelve preceding years. The highest temperature was 67 degrees, on the 18th; the lowest was 20.5 degrees, on the 31st; monthly range, 46.5 degrees; mean at 7 a. m., 35.37 degrees; at 2 p. m., 48.42 degrees; at 9 p. m., 40.64 degrees.

Rain, 1.80 inches, which is 0.51 inches above the January average. Rain fell on 3 days. There was no snow, but a small amount of sleet preceded the rain of the 29th.

Mean cloudiness, 48.49 per cent of the sky, the month being 0.64 per cent cloudier than the average. Number of clear days, 15 (entirely clear, 2); half clear, 7; cloudy, 9 (entirely cloudy, 7). Mean at 7 a. m., 59.05 per cent; at 2 p. m., 41.29 per cent; at 9 p. m., 45.16 per cent.

Wind—southwest, 25 times; northwest, 24 times; southeast, 13 times; northeast, 12 times; north, 3 times; south, 8 times; east, 6 times; west, twice. The entire distance traveled by the wind was 12,861 miles, which gives a mean

daily velocity of 414.87 miles, and a mean hourly velocity of 17.28 miles. The highest velocity was 55 miles an hour, at 1 p. m., on the 21st.

Mean height of barometer, 29.094 inches; at 7 a. m., 29.115 inches; at 2 p. m., 26.067 inches; at 9 p. m., 29.100 inches. Maximum, 29.631 inches, at 9 p. m. on the 12th; minimum, 28.604, at 9 p. m. on the 10th; monthly range, 1.027 inches.

Relative humidity—mean for the month, 73.8; at 7 a. m., 84.3; at 2 p. m., 57.3; at 9 p. m., 79.9; greatest, 100, on 12 occasions; least, 29.2, at 2 p. m. on the 14th. There were 9 fogs, all in the first quarter of the month.

The following table furnishes a comparison with former years:

| JANUARY. | Mean temperature. | Maximum temperature. | Minimum temperature. | Rainfall, in inches. | Mean Cloudiness. | Mean Humidity. |
|---|---|---|---|---|---|---|
| 1868 . . . . . | 23.67 | 64.0 | *-7.0 | 0.36 | 37.00 | . . . |
| 1869 . . . . . | 30.50 | 56.0 | 6.0 | 2.90 | 43.97 | 83.7 |
| 1870 . . . . . | 29.43 | 56.5 | -1.0 | 0.67 | 49.25 | 74.2 |
| 1871 . . . . . | 28.86 | 67.5 | -5.0 | 1.11 | 64.00 | 75.7 |
| 1872 . . . . . | 24.35 | 50.5 | -7.5 | 0.17 | 42.69 | 68.3 |
| 1873 . . . . . | 18.61 | 46.5 | -26.0 | 2.66 | 47.10 | 75.5 |
| 1874 . . . . . | 28.01 | 61.0 | -2.5 | 2.35 | 53.65 | 73.0 |
| 1875 . . . . . | 15.60 | 44.0 | -18.5 | 0.12 | 54.84 | 83.1 |
| 1876 . . . . . | 34.70 | 65.5 | -2.0 | 0.57 | 42.17 | 68.4 |
| 1877 . . . . . | 25.60 | 62.5 | -9.0 | 1.17 | 48.82 | 75.5 |
| 1878 . . . . . | 33.97 | 55.0 | 7.5 | 3.05 | 46.77 | 73.4 |
| 1879 . . . . . | 23.49 | 53.0 | -16.0 | 0.37 | 43.98 | 76.0 |
| 1880 . . . . . | 41.23 | 67.0 | 20.5 | 1.80 | 48.49 | 73.8 |
| Mean of 13 Januaries. | 27.54 | 57.6 | -4.6 | 1.33 | 47.90 | 75.0 |

*The minus sign indicates temperature below zero.

## KANSAS METEOROLOGICAL SUMMARY FOR THE YEAR 1879.

BY PROF. F. H. SNOW, KANSAS STATE UNIVERSITY.

The chief characteristics of the weather of 1879 were the high average temperature of the spring and autumn months, the long period of immunity from severe frosts, the deficient rainfall of March, May and August, the extraordinary rainfall of November, and the low percentage of cloudiness. It is worthy of note that, notwithstanding the deficiency of rain in the months above named, the crops have been abundant in all the agricultural sections of the State.

### TEMPERATURE.

Mean temperature of the year, 54.67 degrees, which is 1.51 degrees above the mean of the eleven preceding years The highest temperature was 99.5 degrees, on August 4; the lowest was 16 degrees below zero, on the 4th of January,

giving a yearly range of 115.5 degrees. Mean temperature at 7 a. m., 48.61 degrees; at 2 p.m., 63.71 degrees; at 9 p.m., 53.18 degrees.

Mean temperature of the winter months, 27.93 degrees, which is 1.94 degrees below the average winter temperature; of the spring, 58.4 degrees, which is 4.83 degrees above the average; of the summer, 76.5 degrees, which is 0.47 degrees below the average; of the autumn, 56.71 degrees, which is 3.90 degrees above the average.

The coldest month of the year was January, with mean temperature 23.49 degrees; the coldest week was January 2d to 8th, with mean temperature 3.9 degrees; the coldest day was January 3d, with mean temperature 9.3 degrees below zero. The mercury fell below zero 13 times, of which 10 were in January and 3 in December.

The warmest month was July, with mean temperature 79.14 degrees; the warmest week was July 3th to 11th, with mean temperature 83.54 degrees; the warmest day was July 22d, with mean temperature 86.9 degrees. The mercury reached or exceeded 90 degrees on 48 days, viz.: 4 in May, 12 in June, 16 in July, 14 in August, and 2 in September.

The last light frost of spring was on April 18th; the first light frost of autumn was on October 10th, giving an interval of 184 days entirely without frost. The last *severe* frost of spring was on April 4th; the first severe frost of autumn was on October 24th, giving an interval of nearly 7 months (203 days) without severe frost.

The severe cold weather of January and the frost of April 3d were very destructive to the buds of peaches, pears and early apples, in many localities; but there was generally a fair crop of small fruits and winter apples.

### RAIN.

The entire amount of rain, including melted snow, was 32.68 inches, which is 2.70 inches below the average annual amount for the 11 preceding years. Either rain or snow fell on 90 days, 12 less than the average. The longest interval without rain during the growing season (March 1st to October 1st) was 19 days, from April 30th to May 19th. The number of thunder showers was 36, of which 9 were in June and 1 in December. There were 5 light hail storms.

### SNOW.

The entire depth of snow was 10.35 inches, of which 0.85 inches fell in January, 4.50 inches in February, 2 inches in November, and 3 inches in December. The last snow of spring was on February 25th; the first snow of autumn was on November 28th.

### FACE OF THE SKY.

The average cloudiness of the year was 40.01 per cent, which is 4.75 per cent below the average. The number of clear days (less than one-third cloudy) was 179; half clear days (from one-third to two-thirds cloudy), 114; cloudy (more than

two-thirds), 72. There were 61 entirely clear and 35 entirely cloudy days. The clearest month was August, with an average cloudiness of 28.92 per cent; the cloudiest month was December, with an average of 51.83 per cent. The mean cloudiness at 7 a.m. was 44.09 per cent; at 2 p.m., 46.27 per cent; at 9 p.m., 29.67 per cent.

### DIRECTION OF THE WIND.

During the year—three observations daily—the wind was from the southwest 272 times; northwest, 238 times; southeast, 158 times; south, 130 times; northeast, 112 times; east, 90 times; north, 71 times; west, 16 times; calm, 8 times. The south winds (including southwest, south and southeast) outnumbered the north winds (including northwest, north and northeast) in the ratio of 560 to 421.

### VELOCITY OF THE WIND.

The number of miles traveled by the wind during the year was 124,768, which is 14,160 miles less than the average for the past 6 years. This gives a mean daily velocity of 341.83 miles, and a mean hourly velocity of 14.24 miles. The highest hourly velocity was 60 miles, on February 25th and March 13th; the highest daily velocity was 960 miles, on March 8th; the highest monthly velocity was 13,787 miles, in March. The three windiest months were March, November and December; the three calmest months were June, July and August. The average hourly velocity at 7 a. m. was 12.78 miles; at 2 p. m., 16.39 miles; at 9 p. m., 14.03 miles.

### BAROMETER.

Mean height of barometer column, 29.127 inches; at 7 a. m., 29.150 inches; at 2 p. m., 29.103 inches; at 9 p. m., 29.126 inches; maximum, 29.745 inches, on January 3d; minimum, 28.534 inches, on December 28th; yearly range, 1.211 inches. The highest monthly mean was 29.253 inches, in January; the lowest was 29.024 inches, in May. The barometer observations are corrected for temperature and instrumental error.

### RELATIVE HUMIIDITY.

The average atmospheric humidity for the year was 67.13; at 7 a. m., 77.86; at 2 p. m., 50 11; at 9 p. m., 73.41. The dampest month was January—mean humidity, 76; the dryest month was March—mean humidity, 56.1. There were 10 fogs during the year. The lowest humidity for any single observation was 12.3, at 2 p. m. March 9th—less than one-eighth of saturation.

The following tables give the mean temperature, the extremes of temperature, the velocity of the wind, the percentage of cloudiness, the relative humidity, and the rainfall, for each month of the year 1879, and a comparison with preceding years:

| MONTHS. | Mean temperature. | Maximum temperature. | Minimum temperature | Miles of Wind. | Mean Cloudiness. | Relative Humidity. | Rainfall, in inches. |
|---|---|---|---|---|---|---|---|
| January . . | 23.49 | 53.0 | −16.0 | 8,309 | 43.98 | 76.0 | 0.37 |
| February. . | 34.06 | 74.0 | 5.0 | 10,097 | 39.04 | 64.7 | 0.41 |
| March . . . | 48.22 | 87.0 | 11.0 | 13,787 | 46.02 | 56.1 | 0.37 |
| April . . . | 56.40 | 84.0 | 20.0 | 11,231 | 49.67 | 61.0 | 4.18 |
| May . . . | 69.50 | 93.0 | 43.0 | 12,057 | 37.20 | 60.9 | 1.60 |
| June . . . | 73.22 | 97.0 | 45.0 | 9,498 | 41.33 | 69.9 | 7.14 |
| July . . . | 79.14 | 97.5 | 62.5 | 6,980 | 34.89 | 73.8 | 3.66 |
| August . . | 75.78 | 99.5 | 49.0 | 6,815 | 28.92 | 63.8 | 1.03 |
| September . | 65.40 | 92.0 | 42.0 | 10,237 | 37.00 | 64.0 | 3.57 |
| October . . | 60.46 | 87.5 | 25.5 | 10,952 | 31.94 | 71.2 | 2.81 |
| November . | 44.26 | 76.5 | 16.0 | 11,964 | 38.33 | 70.6 | 5.15 |
| December . | 26.23 | 65 5 | −9.0 | 12,821 | 51.83 | 74.0 | 2.39 |
| Mean . . . | 54.67 | 83.8 | 24.5 | 10,397 | 40.01 | 67.1 | 2.72 |

COMPARISON WITH PREVIOUS YEARS.

| YEAR. | Mean temperature | Maximum temperature. | Minimum temperature. | Miles of Wind. | Mean Cloudiness. | Relative Humidity. | Rainfall, in inches. |
|---|---|---|---|---|---|---|---|
| 1879 . . . | 54.67 | 99.5 | −16.0 | 124,768 | 40.01 | 67.1 | 32.68 |
| 1878 . . . | 55.33 | 98.0 | −6.0 | 125,793 | 40.65 | 70.4 | 38.39 |
| 1877 . . . | 54.16 | 99.0 | −9.0 | 113,967 | 47.12 | 72.6 | 41.09 |
| 1876 . . . | 52.76 | 98.0 | −5.0 | 148,120 | 41.27 | 66.8 | 44.18 |
| 1875 . . . | 50.60 | 99.0 | −16.5 | 145,316 | 44.81 | 65.5 | 28.87 |
| 1874 . . . | 54.20 | 108.0 | −3.0 | 145,865 | 45.54 | 65.5 | 28.87 |
| 1873 . . . | 52.71 | 104.0 | −26.0 | 154,508 | 42.46 | 64.0 | 32.94 |
| 1872 . . . | 51.90 | 97.0 | −18.0 | . . . . | 44.33 | 64.4 | 32.63 |
| 1871 . . . | 54.30 | 103.0 | −6.0 | . . . . | 47.37 | . . . . | 33.23 |
| 1870 . . . | 54.50 | 102.0 | −10.0 | . . . . | 47.88 | 68.4 | 31.38 |
| 1869 . . . | 50.99 | 96.0 | −5.0 | . . . . | 49.23 | . . . . | 38.51 |
| 1868 . . . | 53.36 | 101.0 | −16.5 | . . . . | 42.35 | . . . . | 37.42 |

In presenting this report, the writer desires to acknowledge his indebtedness to Prof. H. S. S. Smith, for taking the observations during seven weeks' absence during the summer vacation.

## RELIABILITY OF THE WEATHER PREDICTIONS OF THE U. S. SIGNAL SERVICE.

It is quite wonderful to observe the success of the "simultaneous observations" plan of the U. S. Signal Service, as shown by the verifications of the weather predictions of the bureau. The detailed comparison of the tri-daily indications for January, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 84.4 per cent. The

percentage for the four elements are: Weather, 86.9; Direction of the Wind, 83.2; Temperature, 84.5; Barometer, 82.7 per cent. By geographical districts they are: for New England, 85.8; Middle States, 85.8; South Atlantic States, 84.4; Eastern Gulf States, 80.7; Western Gulf States, 80.7; Lower Lake region, 84.3; Upper Lake region, 87.8; Tennessee and the Ohio valley, 84.9; Upper Mississippi 90.3; Southern Pacific coast region, 96.0. There were 10 omissions to predict out of 3,813, or 0.26 per cent. Of the 3,803 predictions that have been made, 156, or 4.10 per cent. are considered to have entirely failed; 129, or 3.39 per cent. were one-fourth verified; 471, or 12 39 per cent. were one-half verified; 421, or 11.07 per cent. were three-fourths verified; 2,626, or 69.05 per cent. were fully verified, so far as can be ascertained from the tri-daily weather maps.

160 Cautionary Signals were displayed during the month, of which 119, or 74.4 per cent. were justified by winds of 25 miles per hour, or over, at, or within the radius of 100 miles of the station. Forty-six Off-shore Signals were displayed, of which 40, or 87.0 per cent. were fully justified; 42, or 91.3 per cent. were justified as to direction; 41, or 89.1 per cent. were justified as to velocity; and 3, or 6.4 per cent. were not justified either as to direction or velocity. Twenty-nine of the Off-shore were changed from Cautionary. 206 Signals of both kinds were displayed, of which 159, or 77.0 per cent. were fully justified. The above does not include signals ordered for fifty display stations, where the velocity is only estimated. Forty-eight cases of winds of 25 miles and over per hour, from scattering stations, were reported, and for which signals had not been ordered. Eight signals were reported late.—*U. S. Monthly Weather Review.*

# CHEMISTRY.

## ANNUAL ASSAY AT THE UNITED STATES MINT.

The annual assay of the coinage at the three mints of the United States was begun in Philadelphia recently by the commissioners appointed by President Hayes to examine and test the fineness and weight of the coins made during the past year.

The "reserved" coins, representing one of every denomination struck off on every working day of the past year, were brought out, tied up in small packages, and opened by the Commission—first, the gold coins from the mint at Philadelphia; second, the silver coins; third, the gold coins from the mint at San Francisco; fourth, the silver coins of the same city; fifth, the gold coins from the mint at Carson, and, sixth, the silver coins from the same depository. Two committees were appointed by the Chair, one to take charge of the weighing and the other the assaying.

After arrangements had been completed for the weighing and assaying, the

reserved gold coins are placed in a black-lead crucible and covered with borax, to assist the fluxing and to prevent the oxidation of the copper alloy. They are thus melted down and stirred, by which a complete mixture is effected, so that an assay piece may be taken from any part of the bar cast out. The piece taken for this purpose is rolled out for convenience of cutting. It is then taken to an assay balance (sensible to the 10,000th of a half-gramme or less), and from it is weighed a half-gramme, which is the normal assay weight for gold, being about 7.7 grains Troy. This weight is stamped 1,000, and all the lesser weights (afterward brought into requisition) are decimal divisions of this weight, down to one ten-thousandth part.

Next, silver is weighed out per the quartation, and as the assay piece, if standard, should contain 900 thousandths, of gold, there must be three times this weight, or 2,700 thousandths of silver, and this is accordingly the quantity used. Thin sheets of lead for cupellation are cut into square pieces and rolled into the form of a hollow cone, and into this are introduced the assay gold and the quartation silver. The lead is then closed around them and pressed into a ball. In the furnace are placed the cupels, and into one of them is deposited the leaden ball with its contents, after which the furnace is closed. When the cupellation has been finished, the metal is allowed to cool slowly, and the disk or button which it forms is detached from the cupel. With a hammer the button is flattened and afterward annealed by bringing it to a red heat. It is then laminated by passing it between rollers, is again annealed, and is rolled loosely into a spiral, or coil, called a cornet. It being ready for the process of quartation, it is placed in a matrass containing about 1¾ ounces of nitric acid, and in that it is boiled ten minutes, as indicated by an electric monitor. The acid is then poured off, and three-fourths of an ounce of stronger acid at thirty-two degrees is substituted for it, in which the gold is boiled ten minutes more. Again the acid is poured off and another boiling in equally strong acid is had. The silver having thus been removed, the gold is taken out, washed in pure water and exposed in a crucible to a red heat for the purpose of drying, strengthening, and annealing. The cornet of gold is placed in the assay balance, and the number of thousandths which it weighs expresses the fineness of the gold assayed in thousandths.

The method employed for testing the accuracy of the process is as follows: A roll of gold of absolute purity, which has been kept under the seal of the Chairman of the Assay Commissioners, is opened in their presence, and from it is taken the weight of 900 parts. To this are added 100 of copper, to make up 1,000 parts of the exact legal standard. The same process is employed as with the other gold, and at the same time after the assay is finished, the pure gold remaining ought to weigh exactly 900. The law allows a deviation one-thousandth for gold coin; that is, from 899 to 901.

In assaying the silver, the reserved coins are melted together in a black-lead crucible, to prevent oxidation and to allow of dipping out. A small portion is poured into water, producing granulation, from which portion the assay is taken.

A different mode is pursued with silver, for the reason that, when silver is alloyed with copper, there is a separation to a greater or less degree between the two metals in the act of gradual solidification. From the sample the weight of 1,115 thousandths is taken, which is dissolved in a glass bottle with nitric silver. Into this solution the large pipette full of standard solution of salt is introduced, and immediately a white precipitation is formed, which is the chloride of silver, and and contains of the metallic silver 1,000 parts. The bottle is violently shaken by a mechanical arrangement, and so continues to be shaken, until the addition of salt water only shows a faint trace of chloride below the upper surface of the liquid. In making the test assay a roll of silver of known absolute purity is kept from year to year under the seal of the Chairman of the Commission. This is opened, and 1,004 parts weighed off and submitted to the same process as employed with the coin. If the salt water used be of the exact standard, the solution in the larger pipette will precipitate 1,000 parts of silver; four measures of the decimal solution will be required to precipitate the remaining four parts. The assay will be finised to-day.—*Philadelphia Press.*

## THE DIAPHOTE.

The Diaphote is an instrument by which you can see by telegraph. Dr. H. E. Licks, of Bethlehem, Pennsylvania, has invented an instrument which he calls by this name, from two Greek words, *dia*, through, and *phos*, light. He read a paper in Reading, the other day, and exhibited his instrument. This consists of a receiving mirror, the wires, a battery, and a reproducing speculum. The receiving mirror is an amalgam of selenium and iodide of silver; the reproducing speculum is a compound of seleninm and chromium. The wires are numerous, as it is necessary to distinctness that a wire should not be required to affect but a very small space. The instrument exhibited had a mirror six inches by four, composed of seventy-two small plates, to each of which a wire was attached, the whole being wrapped by a fine insulated covering. These wires run to a common galvanic battery and thus connect with the reproducing plate. When the circuit is closed, the rays of light are conducted through an ordinary camera, and the accompanying heat produces chemical changes in the amalgam of the mirror, which, modifying the electric current, cause similar changes in the reproducing speculum.

In the experiments at the close of the explanatory lecture, an instrument was taken to a lower room of the building and operated from there to the stage in presence of the audience. Before the mirror in the lower room the committee held in succession an apple, a pen knife, and a trade dollar, which were distinct on the platform above. The date on the trade dollar, thrown on an enlarged screen, was plainly visible, as well as the goddess of liberty. A watch was next used, and the audience could see the movement of the hands. An ink bottle, a flower, parts of a theater hand-bill, were also shown, and when the head of a live

kitten was exhibited, there was great applause, and the inventor warmly congratulated on his success. The Reading *Eagle*, from which we condense this account of the remarkable invention, represents the opinions entertained of its practical value as very high—it being possible for a signal officer on a railroad to see hundreds of miles of track at the same instant. What next?—*Kansas City Journal.*

---

# SCIENTIFIC MISCELLANY.

---

## CANAL ACROSS CENTRAL AMERICA TO THE PACIFIC.

BY E. H. DERBY.

The success of the Suez Canal insures the construction of another ship canal, most important to the United States—one which will form a new route for its coastwise commerce, which now passes around Cape Horn to the Pacific. It will reduce a voyage of 18,000 miles to one less than one-third of that distance, and diminish the time required on the way to one-fifth of the time now taken, replacing the vessel under sail with the steamship of steel. The Pacific railways are adapted to transportation of mails, travelers, and express freight. They are important also for local traffic, but in no respect suited to our chief coasting trade—the conveyance of grain, provisions, timber, coal, fish, and metals between the Atlantic and Pacific. When a ship canal is finished, it will cheapen all our routes to the Pacific, and it is safe to predict that it will reduce the rates of freight between the Atlantic and the Pacific below six dollars per ton, *via* the canal, and we may easily foresee what will be the future course of commerce. The routes across the Isthmus and Central America have been explored and surveyed by both England and the United States, and the estimates for one of them are below the cost of the Suez Canal, while the prospects of business are far more encouraging. The Suez Canal commands the trade between India and Europe, but cannot control the commerce of China and Japan with the United States, or more than half of that between the same countries and Europe, while a ship-canal between the Gulf of Mexico and the Pacific will eventually command twice the tonnage that now passes through the Suez Canal.

It will be a candidate for the vast export of wheat and other grain from our Pacific coast to Europe. The annual production of wheat on our Pacific coast exceeds a million tons, and will soon require a million of tons of shipping to convey it to Europe. The ships would pass twice through the canal, and give it two millions of tonnage. The vast coasting trade of the United States between the Atlantic front and California, Oregon and Alaska would pass through this canal both going and returning, and the varied products of the Pacific coast, in the shape of timber, fish, copper ore, and extent of cargoes would, together, add another

million to its tonnage. The commerce of the United States alone through this canal will supply a tonnage equal to that which pays six millions of dollars each year to the Suez Canal. It will be a candidate for ships on their voyages from Europe for tea to China and Japan, and on their return, and will take nearly the whole tonnage passing between the Atlantic States, China, Japan and the Philippine Islands, and between Europe and the Russian Possessions, and best accommodate the ships engaged in the whale fisheries of the Pacific. Tea, to the extent of two hundred millions of pounds, and occupying one hundred thousand tons of shipping, forms one item of its commerce, which will annually send through the canal nearly a quarter of a million tons of shipping. Then we have the trade between Australia and Europe, one item of which—wool—amounts yearly to three hundred millions of pounds. We may safely calculate that the Australian ships, out and back, will patronize this canal to the amount of three hundred thousand tons.

Peru, with it guano amounting to three or four hundred thousand tons sent annually to Europe; Chili, with its copper and nitrates and return cargoes, with Gautemala, Mexico, and Central America, must furnish at least another million of tons. Then we have the growth of this commerce while the work progresses, together with that due to new facilities, so that the aggregate must reach between five and six millions of tons—nearly twice the tonnage which passes yearly through the Suez Canal. This estimate is not a high one. Ten years since, before the grain trade of California had attained to any importance, the tonnage that would seek the canal was set at 3,300,000 tons by Admiral Davis, of our navy, and the annual saving in cost of freight, interest, and insurance on the property to be transported by this canal, was set by him at ninety-nine millions of dollars.

The estimate seems to be a high one, for it exceeds the computed cost of the canal itself; but the saving must be immense, as this trade is fast increasing, and the cost of transportation may be lessened two-thirds by a ship canal. California has become the chief granary of Great Britain, which now requires annually from other nations two hundred millions of bushels of grain. She prefers the wheat of California to grind with her own moist wheat, and there is no country but California where one man can successfully cultivate five hundred acres of wheat unaided by either man or fertilizer.

With this canal completed, the grain of San Francisco, which is now more than four months on its way to Boston or Liverpool, could be landed there in less than three weeks. The vessel transporting it, instead of making one trip yearly, would accomplish many trips, by the aid of steam, now prohibited by the length of the voyage.

To the United States the canal will be most useful in developing the products of the Pacific coast and exchanging them for our manufactures. To the British Isles it is even more important, as they draw one-fifth of the wheat they consume from California and Oregon, and by means of this canal may save annually a million sterling in freight.

To France it is important for the diffusion of her manufactures over the isles and coasts of the Pacific, while the whole continent of Europe and most of South America are deeply interested in this enterprise.—*Harper's Magazine for March.*

## ANCIENT EGYPT.

BY FRANCIS E. UNDERWOOD.

The history of Egypt can never be fully known, although its memorials are more numerous and more profoundly interesting than the remains of any other ancient civilization. No other people ever took such pains to perpetuate their annals. Every one of their temples and colossal sculptures, as well as their eternal pyramids, seems to have been designed to preserve the name of a Pharaoh and the events of his reign. Mounds of stone along the Nile, and by its old and deserted channels in the Delta, designate the sites of dead and forgotten cities; and every column and pedestal and fragment of wall still bears the indestructible characters which tell of the pride and power of some successor of Amon-ra.

The ruins of Egypt, beyond all others on the planet, show grandeur of design with adequate skill and boundless energy in execution. To an Egyptian architect nothing was impossible. We are not losing sight of the works of the Greeks; but the art and architecture of that lively and accomplished people have been so long domesticated in modern life and blended with modern thought that they give us an impression of elegance and proportion, of refined and tranquil beauty, but never the sense of sublimity. The central idea in Egypt was an all-compelling power, finding expression in original and tremendous forms. The Hall of Columns at Karnak, and the gigantic twin statues of Amen-hotep III, are instances of the purely sublime.—*March Atlantic.*

## WONDERS OF THE VATICAN.

BY EMILY F. WHEELER.

The Vatican, then, is an immense and irregular pile of buildings, erected at different times, and with little attempt at architectural unity. It consists of countless halls and rooms, and these surround courts with colonnades and fountains. Many of them are lighted from above; but others, especially in the library, look out on sunny garden spaces where are close-clipped hedges, trim flower-beds, and orange and lemon trees laden with golden fruit. The halls, given up to statues and pictures—and there is half a mile of them, according to Murray—are cold and stately in their effect; and, despite a *scaldino* here and there, they chill one to the morrow of his bones in half an hour. The Etruscan and Egyptian museums beneath are gloomy, but the library halls are warm and bright. Their walls are adorned with frescoes, their doorways and columns are of marble in all varying

tints. The book-cases are of rare woods, some paneled and carved, some painted with fruit and flower designs on a white or gold ground. These are all you see, the books being invisible. Rare, marble tables hold presents made the popes by kings and emperors in the last century—Sèvres vases from the King of Prussia; malachite from Prince Demidoff; splendid candelabras from Napoleon I; little Prince Louis' baptismal font, sent by Eugenie so long ago; rare illuminated missals, whose covers are adorned with embroideries of gold and gem; a wonderful fald-stool from Tours, a mass of delicate carving in light brown wood, all ferns and wandering vines and bell-flowers, and lace-like canopies over ivory saints six inches high which jewel the sides—all these are but a little of the beautiful things you see. You walk through hall after hall filled with rich and rare and curious articles, and get from every window glimpes of garden green or silvery fountain. You look back from the last hall down a vista so long that you cannot distinguish objects at the other end. The whole effect is of bewildering richness and beauty. But all these museums are much alike, I suppose, to ignorant eyes. The first one seen always stays in your memory as biggest and best.—*Good Company, No. 6.*

---

## MANUFACTURE OF GOLD LEAF.

Gold beating appears to be one of the manipulations in the arts that cannot be successfully imitated by machinery. Numerous attempts have been made to substitute machinery for hand labor, in what appears to be the merely mechanical work of beating, but hitherto without success. All the work of making gold leaf or foil from the ingot or bar is hand labor, with the single exception of the rolling preparatory to beating.

The gold is procured usually at the United States assay office in New York, its purity being "99 fine." For dental purposes even this hardly appreciable alloy must be elimminated; gold foil for filling carious teeth being absolutely pure gold, or as nearly pure as possible. For gilding purposes the purity of the metal varies with the use to which it will be assigned, and its color is also varied to suit tastes or for particular purposes, by the use of silver or copper as an alloy.

When the gold is rolled as thin as practicable between highly finished and hardened steel rollers, the ribbon thus made—about seven-eighths of an inch wide—is cut into squares, each one of which is placed between layers of "gold-beater's skin," an extraordinarily thin parchment, until a pile several inches high, or thick, is made. This pile is then beaten with an iron hammer, with slightly convex faces, on a block or an anvil of marble. In this beating is comprised nearly all the particular art of this manufacture. The hammers used are of different weights in the different stages of the process, the heaviest weighing about twenty pounds each. The leaves in the pack have to be occasionally changed in position, those nearest the outside changing place with those in the center as it is a singular fact that those in the center are widened and thinned much more rapidly than those that come immediately under the face of the hammer. When the leaf is

beaten sufficiently thin it is cut by girls into squares of four inches, and each half placed between the leaves of proper books having red chalk—argillaceous red oxide of iron—rubbed on them. The leaf is cut by a splint of bamboo or cane, the outer or silicious portion forming an edge quite superior to that of steel for this purpose. The process of the silver plate for silvering is similar to that for making gold leaf. The metals are melted in crucibles of Stourbridge clay which are used only once and then broken up and sold with the sweepings of the shop, which bring from $40 to $60 per barrel, according to the amount of the precious metals extracted. A singular fact connected with gold beating is that all the finer gold beater's skins used in Europe or this country are made by one house in England, the secret of their preparation having been kept in the family for several generations.—*Boston Journal of Commerce.*

---

## BIBLE DATES AS ESTABLISHED BY EGYPTIAN MONUMENTS.

REV. JAMES FRENCH.

Chevalier Bunsen, in his work on Practical Corollaries, says: "The only chronology adapted to Universal History is that according to years before and after Christ." Jewish history counts from Christ backward through the line of Jewish Kings. Now it is a remarkable fact that monumental history synchronizes with Jewish history as recorded in the Bible.

One instance, that of Schishonk, King of Egypt, plundering Solomon's temple during the reign of Rehoboam about B. C. 974, we have alluded to in a former article. This is recorded in the temple of Karnac. Schishonk belonged to the 22nd dynasty. There is another record which places Pharaoh Hophra, the 4th King of the 26th dynasty, as contemporary with Zedekiah and Jeremiah, about B. C. 586. Here is a definite period of less than four centuries, extended over four Egyptian dynasties from the 22d to the 26th inclusive.

Bunsen calls these two cases where monumental and Bible history synchronize with scientific exactness, "interesting points of contact." He says the scripture data accord on the most satisfactory manner with the traditions and contemporary monuments of Egypt. He declares further that "the pivots of the history of Egypt, and perhaps of the whole world, are nothing less than these two points." The determination of these dates is reached by the most crucial scientific tests imaginable.

A still more remarkable event, the building of the great Pyramid, occurred, as is not disputed, during the reign of Cheöps of the 4th dynasty. In a former article we showed that it was impossible to have erected it only when its entrance passage pointed to the then North Star, either B. C. 3,440 when Alpha Draconi was moving towards the pole, or B. C. 2,170 when it was moving from it. We are aware that Richard A. Proctor has been endeavoring of late to show that the earliest date was the most probable one, and has quoted one ancient historian to

prove that this accords with history. But this date, that he quotes, was only conjecture and disagrees materially with his own estimate. How much more reasonable, if history be referred to, is the *generally accredited date* given in round numbers by Napoleon at the battle of the Pyramids, "*Soldiers, forty centuries look down upon you.*" And then again the later dates agrees to an inch with its own record, in another and entirely different manner, as we have before described. The preponderance of proof is largely in favor of the later dates, as we have heretofore shown. Proctor considers the entrance passage as built *solely* for astronomical purposes. But what astronomical purpose could be accomplished by building the stones in the entrance passage with joints perpendicular or erect, at the point, which, according to Prof. Smyth, corresponds with its erection B. C. 2,170. No ancient time-marks of the ages have been so distinctly and indelibly recorded as this date of the Great Pyramid, and apparently for a great purpose. Not till the fixed stars are hurled from their orbits, and God Almighty's great clock in the Heavens wears out or gets out of order, can these date-records be obliterated. They are where the conflagration of this globe can not destroy them.

Now here is a definite period of about 1,550 years for twenty-two dynasties, making an average of less than seventy-five years to a dynasty. We do not assume that Egyptian dynasties had any fixed common measure of duration. But we do say that where computation is based on mere hypothesis, some regard should be shown to the proved average of much the greater portion. If we prove that twenty-two out of twenty-six dynasties span over only about 1,550 years, on what reasonable ground can we base a supposition that the three preceding dynasties extended back to any very much more remote period? We have bridged over the dates between Jeremiah and Solomon by four dynasties, and covered without leaving a single chasm unspanned more than one and a half milleniums before Solomon, by eighteen dynasties, back to the fourth, leaving only three more before Pyramid times, to be accounted for by tradition, or based on hypothesis.

Even if we adopt the earlier date now advocated by Proctor, it makes no difference with regard to the time before Cheöps. For according to the most extravagant date-stretchers, Menes the first King of the first dynasty, lived only from 600 to 800 years before Pyramid times. And such historians as Diodorus (whom Proctor relies on for his early historical proof,) together with Herodotus, Eratosthanes and Manetho, all regarded Menes not only as the first mortal King of Egypt, but they were not backward in asserting their belief that he was identical with Misraim the grand-son of Noah.

Whoever can, let him give us a more rational and reliable history of Egyptian origin and dates from a monumental stand-point.

---

## A BOSTON RAILWAY IN ASIA.

A company was organized in Boston, February 8, under a charter from Massachusetts, dated February 6, 1880, for the purpose of constructing and operating

a railroad from Cairo, Egypt, through Port Said and Damascus to connect with the Euphrates Valley Railway, about to be built by an English company. Branch roads and extensions are also provided for by the charter. The Turkish government has been applied to for a concession of the necessary right of way.

## BOOK NOTICES.

THE YOUNGER EDDA. By Rasmus B. Anderson. Crown 8 vo., 302 pp. S. C. Griggs & Co , Chicago; 1880. $2.00.

The Older Edda was written in verse, and has been styled the mother of Scandinavian poetry. The Younger Edda is a collection, in prose, of the myths of the gods, and of explanations of the types and metres of the Pagan poetry of the Northland, and may be regarded as a completion of and commentary upon the Older. It is doubtless a compilation of the works of several authors, though commonly credited to Snorro Sturleson alone. The volume before us is a translation by Prof. Anderson, of the University of Wisconsin, and bears the marks of his almost unequaled knowledge of the Scandinavian languages, as well as of his exceeding fitness for the task of rendering into readable English this quaint compendium of Jewish, Christian, Greek, Pagan, Roman and Icelandic legends concerning the origin of the world, the history of the Scandinavian mythology, etc. It is more complete than any other English or German translation, and gives to the lover of antiquities the most complete and succinct idea of the ancient Teutonic faiths and beliefs, yet published. To such readers this work will have a powerful interest, while to nearly all, the explanatory introduction, copious notes and full index will render it interesting and attractive.

NOTES ON RAILROAD ACCIDENTS. By Charles Francis Adams, Jr. G. P. Putnam's Sons, New York. 12 mo., 280 pp. For sale by the Kansas City Book and News Company. $1.25.

While the bulk of this work is made up of accounts of various railroad disasters occurring within the past fifty years in this country and Europe, a good portion of it is devoted to bringing before the public in this practical and forcible way, the advantage of the Miller Platform and Buffer, the Westinghouse Brake, and the Interlocking and Electric Signal Systems.

Mr. Adams was, for ten years, one of the railroad commissioners of Massachusetts, and as such, necessarily became familiar with the causes and results of railroad accidents of most kinds, and naturally gave much attention to remedies and preventions. The work is written in narrative style and possesses far more attractions to the general reader than the subject would suggest.

It is probably the only compilation of the kind published, and, if for no oth-

er reason, it is interesting because it shows the vast improvements made within a few years, in the appliances adopted for the convenience, comfort and safety of travelers. Among the more interesting chapters may be instanced those upon Accidents and Conservatism, the Protection of Bridges, the Battle of the Brakes, and the Railroad Death-rate.

---

BRAIN-WORK AND OVER-WORK. By Dr. H. C. Wood. Philadelphia, Presley Blakiston, 1880 16 mo., 126 pp. 50 cents.

This is the tenth of the American Health Primers, and one of the best of the series. The author is Clinical Professor of Nervous Diseases in the University of Pennsylvania, and has probably had as much experience in such maladies as any physician of his age in the country. The subject, which is one of vital interest to Americans, is handled in a practical and familiar style, and the suggestions made are eminently u eful. Begining with statistics, the author shows that, while they may offer a solace to nervous people, from the fact that deaths from such diseases are not on the increase, the increasing wear and tear of modern life is showing itself in an increase of the diseases themselves. The work is divided into General Causes of Nervous Trouble, Effects of Emotional and Intellectual Work, Rest in Labor, Rest in Recreation, Rest in Sleep, with general conclusions remedial suggestions, which, if followed by the reader, may in many instances avert nervous prostration, softening of the brain, and other serious affections. These Health Primers are now published by Presley Blakiston, who has purchased the copyright and other interests from Messrs. Lindsay & Blakiston.

---

CIRCULARS OF INFORMATION OF THE BUREAU OF EDUCATION. By Hon. John Eaton, Commissioner. Washington, D. C., Government Printing Office, 1879. Nos. 1 to 5.

These circulars comprise about 240 pages, and consist of treatise upon Training Schools for Nurses; Papers, Addresses and Discussions at various Educational Associations and Conventions during the past two years; Report on the Value of Common School Education to Common Labor, by Dr. Edward Jarvis, of Dorchester, Mass.; illustrated by answers to inquiries, addresses to employers, workmen, and observers; Training Schools of Cookery; American Education, as described by the French Commissioner to the International Exhibition of 1876.

---

THE SCHOOL BULLETIN SERIES. Davis, Bardeen & Co., Syracuse, N. Y. 1880.

Among these we have received Half a Hundred Songs for the School Room and Home, by Hattie Sanford Russell, 35 cents; The Elements of Education, by Chas. J. Buell, a paper read before the Alumni of the State Normal and Training School at Cortland, N. Y., and so highly regarded by them that they requested its publication, 15 cents; Politics and Schools, an able defense of the Public School

as it is, in contra-distinction to the stereotyped addresses which commend only the Public School as it might be, by Prof. Sydney G. Cooke, School Commissioner, First District, Wayne Co., N. Y. All of these are valuable publications, especially to teachers and students who expect to teach.

---

WATER COLOR PAINTING. By Aaron Penley. New York, G. P. Putnam's Sons, 1879. Kansas City Book and News Company; 50c.

This is No. 5 of Putnam's Art Hand-Books, those previously published being Sketching from Nature, Landscape Painting in Oil Colors, Flower Painting, and Figure Drawing; all edited by Susan M. Carter, Superintendent of the Women's Art School, Cooper Union, New York. This series, reprinted from the most capable authors in England, and carefully edited by so competent and practical an expert, must really be what it purports to be, an excellent guide to the student and amateur in the various departments of fine art. The volume under consideration is a complete exposition of the present advanced state of water color painting, as exhibited in the works of the modern schools, and its careful study will enable the student who has the proper degree of taste, and the necessary patience to practice the rules laid down, to become a skillful artist. It is just such a handbook as all such need lying on their tables for reference. The fact that the book is in its thirty-eighth edition is a guaranty that it has been and is still highly appreciated by artists and art students.

---

HOW TO LEARN SHORT-HAND. By Arthur M. Baker. S. R. Wells & Co., New York; 25c.

The demand for short-hand writers has, during the past few years, been rapidly increasing, and necessarily will continue to increase as the importance of all time-saving appliances in business matters is more generally recognized by business men. The telegraph and the telephone are largely depended upon by them; but, for some unexplained reason, very few have adopted stenography as an aid, though it would appear that they should be side by side in the counting-room.

This little work is arranged especially for the use of those desirous of acquiring the art without a teacher, and seems to offer the simplest, most practical and best adapted system for general purposes that has been proposed.

---

METAPHYSICS. A Lecture by Samuel Spahr Laws, LL.D. *Statesman* Print., Columbia, Missouri, 1879.

Dr. Laws is President of the Missouri State University, and Professor of Metaphysics, and this lecture is one of a course delivered during the session of 1878–9 by the Faculty. The object of the author is, first, to disabuse his audience of the impression that metaphysics is necessarily the abstruse and unintelligible subject that prejudice and ridicule have caused it to be regarded; and, next, to place be-

for them a clear and attractive history and explanation of what it really is—the Queen of the Sciences. In these points he has succeeded admirably, and the essay will be read with interest by all who undertake it unappalled by the title.

---

THE COTTON WORM. By Chas. V. Riley, M.A., Ph.D. Washington, D. C., Government Printing Office, 1879.

In this, as in almost everything he touches, Prof. Riley has given us an exhaustive account of the whole subject, including a summary of the natural history of the pest, an account of its enemies, and the best means of controlling it, with numerous illustrations in each of these branches of the subject. It would seem to be of immense advantage to the planters of the cotton States.

---

## OTHER PUBLICATIONS RECEIVED.

Proceedings of the Poughkeepsie Society of Natural Science, October 1, 1878, to July 1, 1879.—No. 5 of the Publications of the Cincinnati Observatory, being a record of micrometrical measurements of 1,054 double stars, observed from July 1, 1878, to September 1, 1879, under the superintendence of Ormond Stone, A.M., Director.—Report on Magnetic Observations in Missouri during the Summer of 1879, by Francis E. Nipher, Professor of Physics in Washington University, St. Louis, Missouri.—Catalogue of Marietta College, Ohio, 1879–80.—Catalogue of Washington University, St. Louis, 1879–80.

---

# EDITORIAL NOTES.

THE regular meeting of the Kansas City Academy of Science for February, was postponed on account of the lecture of Rev. S. B. Bell, on the same evening, he being a prominent member of the Academy, and many of the members desirous of hearing him.

---

THE lecture of Prof. F. E. Nipher, of Washington University, in the extra course of the Academy of Science, was delivered on the 17th of February. A full house was present and the lecture was received with every evidence of appreciative approbation. It will be published in full in the next issue of the REVIEW.

---

ON March 26th, Professor R. A. Proctor will deliver a lecture under the auspices of the Academy of Science, at the Opera House. Subject: "The Birth and Death of Worlds," one of the most brilliant and interesting of his series. The largest audiences ever congregated in New York, Boston and other large cities of this country, have listened to this lecture and gazed upon the splendid scioptic-con illustrations with enthusiasm and profit. The people of Kansas City are to be congratulated upon having this opportunity offered them, as Prof. Proctor goes from here to the Pacific Coast.

---

DR. JOHN RAE writes as follows, from London, England: "I have read with interest and pleasure the paper, 'Peculiarities of

Missouri Ornithology,' in the January number of the KANSAS CITY REVIEW, in which I notice one little mistake. The 'Brant' is not the 'laughing goose,' but a different bird altogether; the former being much smaller than the latter. The peculiarity of the leading-goose or gander making a precipitate tumbling-down movement on deciding to alight, when flying at a great height, is not peculiar to the 'Brant.' I have seen the snow-geese, on their arrival from the North, or the shores of Hudson's Bay, do the same thing scores of times."

---

THE committee on the proposed monument to the memory of the late Prof. B. F. Mudge, have issued a circular in which they say:

"It is proposed to raise one thousand dollars for the erection of this monument, and the many friends of our beloved leader and associate are cordially invited to render all possible assistance. Local committees will be authorized to receive subscriptions in the chief towns of the State. Individuals not thus solicited are hereby invited to send their contributions to the Treasurer, Dr. R. J. Brown, Leavenworth, Kansas."

The people of Kansas City should subscribe at least one hundred dollars toward this fund. Photographs of Prof. Mudge been placed in the hands of Mr. T. S. Case, of this city, who will present one to each subscriber of one dollar towards this object.

---

THE *Daily New York Graphic*, in addition to the many features that have rendered it so popular among the best classes throughout the country, furnishes full financial and mining reports from all sections of the country.

---

PROF. MASKELYNE has decided that the diamonds, supposed to have been manufactured by Mr. McTear, are in reality only silicates. At the same time he publishes his belief that those manufactured by Mr. Hannay are genuine, and the only instances of artificially crystallized carbon ever brought to his notice. Prof. Roscoe, of Owens College, Manchester, says he regards the evidence thus far submitted by J. Ballantyne Hannay as insufficient to establish the conclusion. Dr. R. S. Marsden, of Sheffield, England, by a different process from any thing known heretofore, has also obtained a crystalline body, believed to be crystallized carbon, or diamond.

---

ACCORDING to a *Boston Journal of Commerce* correspondent, the Lowe water-gas is a perfect success, and can be furnished ready for use, including fixtures for lighting, heating, and cooking, at an expense to the consumer, of not over fifteen cents per thousand feet and at the same time give the manufacturers a profit of three hundred per cent.

---

A FRIEND sends the following extract from a recent letter from Capt. Kennedy, of St. Andrews, Manitoba: "I have again very cordially to thank you for now a third number of that exceedingly well gotten up, and very interesting publication, THE KANSAS CITY REVIEW. When I met my old friend, J. N. McTavish, of the Hudson's Bay Company, the other day, his first remark was, 'Have you seen the KANSAS CITY REVIEW? I never thought they could have gotten up so able a paper way down in Missouri!'"

---

THE *Atlantic Monthly* has always numbered the ablest and best American writers among its contributors. The April number will give the first chapters of Mr. Aldrich's new story. It will also contain short stories by Mrs. Rose Terry Cooke and Mr. W. H. Bishop; and the fourth installment of Mr. Howell's serial. Among its literary attractions will be a paper on "A Woman of Genius," by Miss H. W. Preston; and a study of Coleridge, by Mr. G. P. Lathrop; there will be a very valuable and interesting article giving reminiscenses and and couversations of the late Wm. M. Hunt; and the third number of Reminiscences of Washington. It is hoped that a paper by the author of "Certain Dangerous Tendencies in American Life," equal to that remarkable article in value and interest, will appear in the same issue.

---

THE Topeka Scientific and Literary Club was organized about one year ago, by a num-

ber of gentlemen and ladies of scientific and literary tastes, for the purpose of mutual improvement, profit and pleasure. The membership of the club consists of four classes—Active, Associate, Honorary, and Corresponding. Active members are subject to detail for the preparation and presentation of papers, which are subject to discussion by the Club. Associate members are entitled to vote and to participate in discussions, but are not subject to detail for the preparation of papers. Honorary and Corresponding members are assigned the functions usually possessed by members of that class. For the present year the officers are as follows: President, Prof. John T. Lovewell; Vice-President, Miss Eunice A. Lyman; Secretary, Geo. S. Chase; Treasurer, J. Lee Knight.

---

EDISON feels so sanguine of the success of his electric light, that he has already taken steps toward establishing central stations in New York City, and has perfected his plans for districting the city, each district containing from twenty-five to thirty stations. Each station will be supplied with five Holly engines of from 250 to 300 horse power. Four of these engines will be in constant use, the fifth to be reserved for use in the event of an accident or any of the others. Each station will occupy a space of 50 x 100 feet. He claims that he can stand by the switchboard in his laboratory and extinguish any or all of the lights in the park or in the houses illuminated from his laboratory, and that in less than a year he will have the electric light in successful operation in New York.

---

THE subject of Arctic Exploration is agitating scientific circles considerably just at the present, and the colonization scheme of Captain Howgate seems to be favored by nearly, if not quite all practical men. We notice an account of an interview of Dr. Octave Pavy by a *Globe-Democrat* reporter, in which that explorer and writer speaks of it as "an admirable plan, and one that must succeed." Captain Silas Bent, of St. Louis, also speaks highly of it, while of Eastern scientists, Dr. Hayes, Profs. Henry, Loomis, and Silliman have all endorsed it in strong terms.

It will be seen from an article in this number of the REVIEW, that Captain Howgate has offered to the government, free of charge for use, or liability in case of loss or damage, his steamer, the Gulnare, for a trip to the polar regions, thus "proving his faith by his works" in the most satisfactory manner.

---

AN arrangement has been entered into between the English Post-office and Bell's Telephone Company, by which the Postmaster-General undertakes to give every facility for the extension of telephone communications. The Telephone Company will pay a royalty to the Post-office, and may use the post-offices and staffs under certain conditions for their work. Thus telephone wires may be run from a post-office to the town offices or country residences of gentlemen, and telegrams arriving at post-offices for them may immediately be communicated by telephone, thus saving time.

---

THE Silverton, Col., *La Plata Miner*, of February 14th, says: "The continued fall of snow is discouraging. Mining operations are hindered, travel is impeded, and mails are delayed, business interupted and pleasure thwarted. The snow is from four to eight feet deep on a level, and in some places where it has drifted, one would have to sink a prospecting shaft to find out its depth. Still we anticipate an early spring and a big rush to this camp. Indications point to the fact that the coming season will be one of the most prosperous ever enjoyed by the San Juan country."

---

AT the London Physical Society, January 24th, Herr Faber exhibited his new speaking machine, which imitates the human voice by means of artificial vocal organs of wood and rubber operated by keys like a piano. Fourteen distinct vocal sounds can be uttered by this instrument, and by combining these, every word in any language can be produced in higher or lower tones, as well as the sounds of laughing and whispering.

XUM

A RECENT visit to the Kansas University gave us additional reason to believe that it is one of the best managed, and most completely equipped institutions in the country and that its professors are able, zealous and competent gentlemen, while its students are unusually enthusiastic and ardent in their devotion to the branches of education in which they are respectively engaged.

---

THE proposition of Mr. Eads, to construct a ship railway across the American Isthmus, is now before Congress in the form of a bill authorizing him and his associates to organize a company for the purpose of securing the necessary concession from one of the Central American States, and to locate and construct the necessary works.

We hope that Mr. Eads will obtain the careful and liberal consideration of Congress. He has given such evidence of ability, courage and indomitable energy in great engineering works during the last twenty years, in the construction of the gun-boats, the St. Louis bridge, and the jetties at the mouth of the Mississippi River, that the country will feel assured that the solution of this difficult and deeply interesting question is near at hand if it be intrusted to him.

---

BY a decree of December 14, 1874, His Majesty the King of the Belgians offered an annual prize of twenty-five thousand francs for the encouragement of intellectual effort. The prize for the year 1881, for which authors of all nations may compete, will be awarded to "The best work on the means of improving ports established on low and sandy coasts like those of Belgium." Foreigners desiring to compete for this prize will be required to send their works, either printed or in manuscript, to the Minister of the Interior, at Brussels, before the 1st day of January, 1881.

---

WE notice that, at the State Convention soon to be held in the interest of Immigration, among other distinguished writers and essayists, "Geo. M. Shelley, mayor of Kansas City, is to furnish an article upon Kansas City, its Wealth and Industries: its Progress and Prospects."

---

THE *Engineering and Mining Journal*, with which have been incorporated the *Coal and Iron Record*, the *Mining Review*, and the *Polytechnic Review*, continues to be, as we have heretofore stated, a most reliable record of progress in metallurgy, engineering, mining and general science. Its editors are practical experts in their respective departments, and endeavor to give strictly accurate and just accounts of what is going on in the country. We are led to make these comments just at this time because our friend Professor C. E. Robins, late of Summit, Colorado, an experienced mining engineer, has recently been added to its staff, which must necessarily increase its popularity wherever he is known.

---

THE *Popular Science Monthly* for March is rich in the variety of its contributions, but is especially strong in the direction of education. In this field it is doing a most important public work, its educational papers being abler and more advanced in their treatment of principles than those contained in journals professedly devoted to the subject. The contents for March are: The Association of Ideas (illustrated), by William James, M.D.; Dolmens in Japan (illustrated), by Professor Edward S. Morse; The Study of Political Economy, by Henry George; Ward's Natural Science Establishment, by Professor Joseph Leidy; The Force Behind Nature, by William B. Carpenter, F.R.S.; New Views of Animal Transformations (illustrated), by Edmond Perrier; The Duty of Enjoyment; Intemperance in Study, by D. Hack Tuke, F.R.C.P.; Water as Fuel, by William C. Conant; The Early Free Schools of America, by Alice H. Rhine; Prehistoric Ruins in Southern Colorado, by Henry Gannett; The Convent of the Capuchins, by Arthur Searle; Athletics in Schools; The Matamata (illustrated), by E. Sauvage; Frost Phenomena in Southern Russia; Sketch of Carl Ritter (with portrait); Correspondence, Editor's Table, Literary Notices, Popular Miscellany, and Notes.